Foreword

This soil survey contains information that can be used in land-planning programs in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for use by the National Parks Service. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are cinder cones.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information is available at the local office of the Natural Resources Conservation Service or the National Park Service.

Luana E. Kiger
State Conservationist
Natural Resources Conservation Service

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1997. Soil names and descriptions were approved in 1998. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1997. This survey was made cooperatively by the Natural Resources Conservation Service and the National Park Service The survey is part of the technical assistance furnished to the Craters of the Moon National Monument.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Soil Survey of
Craters of the Moon National Monument, Idaho

Fieldwork by Rulon Winward
Vegetative data by Mark Johnson and Kent Morrison
Final manuscript complied by Neil Peterson

United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with the United States Department of the Interior, National Parks Service.

Craters of the Moon National Monument is located in the central part of Idaho. It includes parts of Butte and Blaine Counties. It is in the northern edge of the Snake River Plain. The total area is about 21,650 hectare (53,500 acres) or about 217 square kilometers (83 square miles). It encompasses a narrow belt of faults, fissures, cones, and craters called the Great Rift. The Monument's northern end, north of U.S. Highway 93, includes foothills of the Pioneer Mountains. Craters of the Moon National Monument is administered by the National Parks Service.

The survey area consists mainly of lava fields of two general types, aa and pahoehoe, both of which are relatively recent flows compared to those elsewhere in the Snake River Plain. The area also includes the foothills north of U.S. Highway 93, which are dominantly limestone, conglomerates, and quartzite with varying amounts of volcanic ash and pyroclastic materials in the surface.

The highest point in the survey area is in the north hills at about 2415 meters (7,729 feet). The lowest point is at about 1625 meters (4880 feet) and is in the southwestern part by Carey Kipuka. The tallest cone, Big Cinder Butte, rises more than 188 meters (600 feet) above the surrounding plain.

This soil survey is an inventory and evaluation of the soils in the survey area. The survey is intended to be useful in providing information about soils that will be helpful in land use management. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing this soil survey, soil scientists and range conservationists collected extensive field data about the nature and behavioral characteristics of the soils at the Craters of the Moon National Monument. They collected data on erosion, doughtiness, flooding, ponding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in the "Use and Management of the Soils" section can be used to plan the use and management of soils for range and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Interpretive ratings help engineers, planners, and others understand how soil properties influence important nonagricultural uses, such as building site development and construction materials. The ratings indicate the most restrictive soil features affecting the suitability of the soils for these uses.

Soils are rated in their natural state. No unusual modification of the soil site or material is made other than that which is considered normal practice for the rated use. Even though soils may have limitations, it is important to remember that engineers and others can modify soil features or can design or adjust the plans for a structure to compensate for most of the limitations. Most of these practices, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy (9), the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named

the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit.

General Nature of the Survey Area

This section gives general information concerning the survey area. It discusses history and development, natural resources, and climate.

History and Development

Craters of the Moon National Monument is located in the central part of Idaho. The first reported exploration of the periphery of the area was led by Benjamin L. E. Bonneville, a trapper who extended the search for fur beyond the Snake River in 1833-1834 (4). Harold T. Stearns believed that the area also was visited sometime during 1840-45 by Father DeSmet, a Belgian priest. (8)

During the 1840s and 1850s, thousands of emigrants crossed the Snake River Plain on the Oregon Trail. By 1862 hostilities between emigrants and Native Americans along the Snake River had intensified to the extent that emigrants left the Snake River at Fort Hall and instead took Goodale's Cutoff, which ran along the northern edge of the Snake River Plain and skirted the Craters of the Moon lava field. A portion of Goodale's Cutoff passes through the northern end of Craters of the Moon National Monument. Diaries of the emigrants vividly describe the Craters of the Moon area (4). By 1904 pioneers referred to the area as Craters of the Moon.

Stearns reported that Arco resident J. W. Powell searched for livestock water supplies in the Craters of the Moon lava field in 1879 and again with Walter Ferris in 1880's. (8) In 1901 I. C. Russell of the U.S. Geological Survey (USGS) led the first scientific exploration of the northern Craters of the Moon area (7). In 1921, Stearns, also of the USGS, explored the area in greater detail and recommended the creation of Craters of the Moon National Monument (8). Robert L. Limbert, a taxidermist and adventurer from Boise, Idaho, also explored the Craters of the Moon area in the early 1920's and named many of the monument's geologic features. (3)

On May 2, 1924, President Calvin Coolidge proclaimed 101 square kilometers as Craters of the Moon National Monument. After

Stearns returned to the monument in 1926 to finish surveying the area, it was expanded to 215 square kilometers (4).

In 1962, 21.65 square kilometers were added to the monument to protect the 0.73-square-kilometer Carey Kipuka for scientific study. In 1970, 175 square kilometers were set aside as the Craters of the Moon Wilderness Area.

Natural Resources

Soil and water are the most important natural resources in the survey area. Recreation is the most important marketable product.

Water in the survey area is used primarily for domestic purposes and/or wildlife. Springs supply most of the water used for domestic purposes throughout the area. Seasonal streams and spring developments provide adequate supplies of water for wildlife in most parts of the survey area.

Mining activity in the area that occurred before the Monument was established has ceased.

Climate

The table “Temperature and Precipitation” gives data on temperature and precipitation for the survey area as recorded at Craters of the Moon National Monument Headquarters, Idaho, in the period 1961 to 1990. The table “Freeze Dates in Spring and Fall” shows probable dates of the first freeze in fall and the last freeze in spring. Data on the length of the growing season is given in the table “Growing Season.”

The average temperature is 42 degrees F, the average daily minimum temperature is 29 degrees F, and the average daily maximum temperature is 55 degrees F.

The total average precipitation is about 16 inches. The average seasonal snowfall is about 90 inches.

Detailed Soil Map Units

The map units delineated on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses.12) They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading "Use and Management of the Soils."

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer, all of soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness,

degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Infernocone gravelly sandy loam, 2 to 20 percent slopes, is a phase of the Infernocone series. This type of map unit is called a consociation which means that the map unit is comprised dominantly of one major soil.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or associations.

A complex consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Sunsetcone-Grassycone complex, 30 to 50 percent slopes, is an example.

An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Hal-Moonville association, 15 to 60 percent slopes, is an example.

This survey includes miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Lava flows is an example.

The "Glossary" defines many of the terms used in describing the soils or miscellaneous areas.

Map Unit Descriptions

1 - Lava flows

Lava flows consist of barren flows of basalt associated with recent volcanic activity typified by the Craters of the Moon National Monument. Pressure ridges, fissures, and sinkholes are common features.

MAJOR USES

wildlife habitat

This unit provides habitat for small rodents, rabbits, marmots, bobcats, sage grouse, hawks, falcons and snakes.

2 - Lava flows-Cinderhurst complex, 2 to 15 percent slopes

COMPOSITION

Lava flows and similar inclusions - 70 percent
Cinderhurst soils and similar inclusions - 20 percent
Contrasting inclusions - 10 percent

SETTING

Landform: plain
Elevation: 4,800 to 6,000 feet
Climatic Data:
precipitation - about 16 inches
air temperature - about 42 degrees F
frost-free period - about 80 days

LAVA FLOWS

Lava flows consist of barren flows of basalt associated with recent volcanic activity typified by the Craters of the Moon National Monument. Pressure ridges, fissures, and sinkholes are common features.

CINDERHURST SOIL

Position on landscape: recent lava plains

Depth class: very shallow
Drainage class: well drained
Permeability: moderate
Available water capacity: 0.5 to 1.0 inch
Potential rooting depth: 4 to 10 inches
Runoff: slow
Hazard of erosion by water: slight

Typical profile:
0 to 3 inches - brown extremely cobbly silt loam
3 to 8 inches - dark yellowish brown very cobbly silt loam
8 inches - bedrock

CONTRASTING INCLUSIONS

Soils with cobbly loam surfaces (5 percent)

Soils with cobbly loam surfaces and that are moderately deep to bedrock (5 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITE

Cinderhurst soil

010AY020ID Mixed Shrub 12-16" PPT. ARVA2/PONE3 (mountain big sagebrush/Nevada bluegrass)

3 - Lava flows-Cinderhurst extremely shallow complex, 2 to 15 percent slopes

COMPOSITION

Lava flows and similar inclusions - 70 percent
Cinderhurst soil and similar inclusions - 20 percent
Contrasting inclusions - 10 percent

SETTING

Landform: plain
Elevation: 4,800 to 6,000 feet
Climatic Data:
precipitation - about 16 inches
air temperature - about 42 degrees F
frost-free period - about 80 days

LAVA FLOWS

Lava flows consist of barren flows of basalt associated with recent volcanic activity typified by the Craters of the Moon National Monument. Pressure ridges, fissures, and sinkholes are common features.

CINDERHURST SOIL

Position on landscape: recent lava plains
Depth class: extremely shallow
Drainage class: well drained
Permeability: moderate
Available water capacity: 0.1 to 0.5 inch
Potential rooting depth: 1 to 4 inches
Runoff: slow
Hazard of erosion by water: slight

Typical profile:
0 to 4 inches - brown extremely cobbly silt loam
4 inches - bedrock

CONTRASTING INCLUSIONS

Soils with cobbly loam surfaces. (5 percent)

Soils with cobbly loam surfaces and that are very shallow to bedrock. (5 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITES

Cinderhurst soil - 010AY020ID Mixed Shrub 12-16" PPT. ARVA2/PONE3 (mountain big sagebrush/Nevada bluegrass)

4 - Treemold-Silentcone-Lava flows complex, 2 to 15 percent slopes

COMPOSITION

Treemold soil and similar inclusions - 40 percent
Silentcone soil and similar inclusions - 30 percent
Lava flows and similar inclusions - 20 percent
Contrasting inclusions - 10 percent

SETTING

Landform: plain
Elevation: 4,600 to 6,000 feet
Climatic Data:
precipitation - about 16 inches
air temperature - about 42 degrees F
frost-free period - about 80 days

TREEMOLD SOIL

Position on landscape: recent lava plains
Depth class: very shallow
Drainage class: well drained
Permeability: moderate
Available water capacity: 0.5 to 1.0 inch
Potential rooting depth: 4 to 10 inches
Runoff: slow
Hazard of erosion by water: slight

Typical profile:
0 to 2 inches - brown very gravelly loam
2 to 9 inches - yellowish brown very gravelly sandy loam
9 inches - bedrock

SILENTCONE SOIL

Position on landscape: recent lava plains
Depth class: moderately deep
Drainage class: well drained
Permeability: moderate
Available water capacity: 2.0 to 2.5 inches
Potential rooting depth: 20 to 30 inches
Runoff: slow
Hazard of erosion by water: slight

Typical profile:
0 to 4 inches - dark grayish brown very gravelly loam
4 to 24 inches - brown very gravelly loam
24 inches - basalt with vertical fractures

LAVA FLOWS

Lava flows consist of barren flows of basalt associated with recent volcanic activity typified by the Craters of the Moon National Monument. Pressure ridges, fissures, and sinkholes are common features.

CONTRASTING INCLUSIONS

Soils with cobbly loam surfaces. (5 percent)

Soils with cobbly loam surfaces and that are moderately deep to bedrock. (5 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITES

Treemold Soil

Dominant vegetation in potential natural plant community on the Treemold soil is as follows: Grasses consisting of Sandberg bluegrass and bottlebrush squirreltail that make up about 20 percent of the plant community; forbs consisting of scabland penstemon, wyeth buckwheat and blue eyed mary that make up about 10 percent of the plant community; and Shrubs consisting of low sagebrush and Hood's phlox

that make up about 70 percent of the plant community. Annual production on an air-dry basis in a normal year is about 300 pounds per acre.

Silentcone Soil

013XY006ID Sandy Loam 16-22" PPT
ARVA2/PSSP6 (mountain big sagebrush/bluebunch wheatgrass)

5 – Cinder land-Northcrater association, 2 to 50 percent slopes

COMPOSITION

Cinder land and similar inclusions - 45 percent
Northcrater and similar inclusions - 40 percent
Contrasting inclusions - 15 percent

SETTING

Landform: cinder cones and plains
Elevation: 5,400 to 6,500 feet
Climatic Data:
precipitation - about 16 inches
air temperature - about 42 degrees F
frost-free period - about 80 days

CINDER LAND

Cinder land consists of barren areas of cinders on slopes of 20 to 50 percent. These areas are associated with recent volcanic activity, typified by the Craters of the Moon National Monument.

NORTHCRATER SOIL

Position on landscape: cinder cones having slopes of 2 to 25 percent on recent lava plains

Depth class: very deep
Drainage class: well drained
Permeability: rapid
Available water capacity: 1.5 to 2.5 inches
Potential depth: 60 inches or more
Runoff: slow to medium
Hazard of erosion by water: slight to moderate

Typical profile:
0 to 8 inches - very dark yellowish brown very gravelly loamy sand
8 to 12 inches - very dark brown very gravelly loamy sand
12 to 60 inches - dark yellowish brown, very dark grayish brown, and very dark brown very gravelly loamy sand

CONTRASTING INCLUSIONS

Soils with cobbly loam surfaces. (5 percent)

Soils with cobbly loam surfaces and that are moderately deep to bedrock. (10 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITE

Northcrater Soil

Dominant vegetation in potential natural plant community on the Northcrater soil is as follows. Grasses consisting of Indian ricegrass and bottlebrush squirreltail that make up about 5 percent of the plant community. Forbs consisting of monkey flower, dwarf onion, dwarf buckwheat and white forget-me-not that make up about 75 percent of the plant community. Shrubs consisting of wyeth buckwheat that make up about 20 percent of the plant community. Annual production on an air-dry basis in a normal year is about 150 pounds per acre.

6 - Bigcinder sandy loam, 20 to 40 percent slopes

COMPOSITION

Bigcinder soil and similar inclusions - 85 percent
Contrasting inclusions - 15 percent

SETTING

Landform: cinder cones on plains
Elevation: 4,800 to 6,000 feet
Climatic Data:
precipitation - about 16 inches
air temperature - about 40 degrees F
frost-free period - about 50 days

BIGCINDER SOIL

Position on landscape: cinder cones on recent lava plains

Depth class: very deep
Drainage class: well drained
Permeability: rapid
Available water capacity: 1.0 to 1.5 inches
Potential rooting depth: 60 inches or more
Runoff: medium
Hazard of erosion by water: slight

Typical profile:
0 to 2 inches - dark yellowish brown sandy loam
2 to 10 inches - very dark brown and dark brown very gravelly sandy loam
10 to 20 inches – gravel (cinders)
20 to 30 inches - yellowish brown very gravelly loamy sand
30 to 60 inches - black gravel

CONTRASTING INCLUSIONS

Soils that are moderately deep to bedrock (15 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITE

Bigcinder Soil

Dominant vegetation in potential natural plant community on the Bigcinder soil is as follows. Grasses consisting of Sandberg bluegrass and basin wildrye that make up about 15 percent of the plant community. Forbs consisting of wyeth biscuitroot, waterleaf, tapertip hawksbeard, wyeth buckwheat, sticky geranium and hawkweed that make up about 20 percent of the plant community. Shrubs consisting of antelope bitterbrush and mountain big sagebrush that make up about 65 percent of the plant community. Trees consisting of limber pine that make up about 50 trees per acre. Annual production on an air-dry basis in a normal year is about 1,800 pounds per acre.

7 - Infernocone gravelly sandy loam, 2 to 20 percent slopes

COMPOSITION

Infernocone soil and similar inclusions - 85 percent
Contrasting inclusions - 15 percent

SETTING

Landform: cinder cones on plains
Elevation: 6,000 to 8,500 feet
Climatic Data:
precipitation - about 16 inches
air temperature - about 42 degrees F
frost-free period - about 80 days

INFERNOCONE SOIL

Position on landscape: cinder cones on recent lava plains

Depth class: very deep
Drainage class: well drained
Permeability: moderate over rapid
Available water capacity: 5.0 to 6.0 inches
Potential rooting depth: 60 inches or more
Runoff: slow
Hazard of erosion by water: slight

Typical profile:
0 to 25 inches - dark brown and dark yellowish brown gravelly sandy loam
25 to 35 inches - very dark brown very gravelly sandy loam
35 to 60 inches - very dark brown gravel

CONTRASTING INCLUSIONS:

Soils that are moderately deep to cinders. (10 percent)

Soils that are shallow to cinders. (5 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITE

Infernocone Soil

10AY008ID North Slope Loamy 16-20" PPT ARVA2/FEID (mountain big sagebrush/Idaho fescue)

8 - Infernocone gravelly sandy loam, 20 to 40 percent slopes

COMPOSITION

Infernocone soil and similar inclusions - 85 percent
Contrasting inclusions - 15 percent

SETTING

Landform: cinder cones on plains
Elevation: 6,000 to 8,500 feet
Climatic Data:
precipitation - about 16 inches
air temperature - about 42 degrees F
frost-free period - about 80 days

INFERNOCONE SOIL

Position on landscape: recent lava plains

Depth class: very deep
Drainage class: well drained
Permeability: moderate over rapid
Available water capacity: 5.0 to 6.0 inches
Potential rooting depth: 60 inches or more
Runoff: slow
Hazard of erosion by water: slight

Typical profile:
0 to 25 inches - dark brown and dark yellowish brown gravelly sandy loam
25 to 35 inches - very dark brown very gravelly sandy loam
35 to 60 inches - very dark brown gravel

CONTRASTING INCLUSIONS

Soils that are moderately deep to cinders. (10 percent)

Soils that are shallow to cinders. (5 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITE

Infernocone Soil

10AY008ID North Slope Loamy 16-20" PPT ARVA2/FEID (mountain big sagebrush/ Idaho fescue)

9 - Echocrater gravelly loamy sand, 20 to 40 percent slopes

COMPOSITION

Echocrater soil and similar inclusions - 85 percent
Contrasting inclusions - 15 percent

SETTING

Landform: cinder cones
Elevation: 5,800 to 7,500 feet
Climatic Data:
precipitation - about 16 inches
air temperature - about 42 degrees F
frost-free period - about 80 days

ECHOCRATER SOIL

Position on landscape: cinder cones on recent lava plains

Depth class: very deep
Drainage class: well drained
Permeability: rapid
Available water capacity: 1.5 to 2.0 inches
Potential rooting depth: 60 inches or more
Runoff: slow to medium
Hazard of erosion by water: slight to moderate

Typical profile:
0 to 8 inches - dark grayish brown gravelly loamy sand
8 to 25 inches – brown and very dark brown very gravelly loamy sand
25 to 60 inches - very dark brown gravel

CONTRASTING INCLUSIONS

Soils that are moderately deep to cinders. (10 percent)

Soils that are shallow to cinders. (5 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITE

Echocrater Soil

013XY006ID Sandy loamy 16-22" PPT
ARVA2/PSSS6 (mountain big sagebrush/bluebunch wheatgrass)

10 - Roundknoll association, 2 to 20 percent slopes

COMPOSITION

Roundknoll soil on south- and west-facing slopes of 2 to 15 percent and similar inclusions - 50 percent

Roundknoll soil on north- and east-facing slopes of 12 to 20 percent and similar inclusions - 35 percent
Contrasting inclusions - 15 percent

SETTING

Landform: kipukas
Elevation: 5,400 to 5,800 feet
Climatic Data:
precipitation - about 16 inches
air temperature - about 42 degrees F
frost-free period - about 80 days

ROUNDKNOLL SOIL

Position on landscape: kipukas on lava plains

Depth class: very deep
Drainage class: well drained
Permeability: rapid
Available water capacity: 1.0 to 2.5 inches
Potential rooting depth: 60 inches or more
Runoff: slow
Hazard of erosion by water: slight

Typical Profile:
0 to 10 inches – brown and yellowish brown gravelly loamy sand
10 to 15 inches – brown extremely gravelly loamy sand
15 to 20 inches – brown very gravelly loamy sand
20 to 30 inches – pale brown extremely gravelly loamy sand
30 to 60 inches – pale brown extremely gravelly sand

CONTRASTING INCLUSIONS

Soils with cobbly loam surfaces. (5 percent)

Soils with cobbly loam surfaces and are moderately deep to bedrock. (10 percent)

MAJOR USES

rangeland

wildlife habitat

ECOLOGICAL SITE

Roundknoll Soil

013XY006ID Sandy Loam 16-22" PPT ARVA2/PSSS6 (mountain big sagebrush/bluebunch wheatgrass)

11 - Hal-Moonville association, 15 to 60 percent slopes

COMPOSITION

Hal soil and similar inclusions - 60 percent
Moonville soil and similar inclusions - 20 percent
Contrasting inclusions - 20 percent

SETTING
Landform: mountains
Elevation: 6,000 to 7,200 feet
Climatic Data:
precipitation - about 18 inches
air temperature - about 40 degrees F
frost-free period - about 50 days

HAL SOIL

Position on landscape: mountainsides
Aspect: north- and east-facing slopes
Slope: 30 to 60 percent
Depth class: very deep
Drainage class: well drained
Permeability: moderate over rapid
Available water capacity: 5.0 to 7.0 inches
Potential rooting depth: 60 inches or more
Runoff: medium to very high
Hazard of erosion by water: severe to very severe

Typical profile:
0 to 6 inches - brown gravelly loam
6 to 12 inches - brown gravelly loam
12 to 24 inches - brown gravelly loam
24 to 40 inches - brown gravelly loam
40 to 60 inches - very dark brown extremely gravelly loamy coarse sand

MOONVILLE SOIL

Position on landscape: mountainsides
Aspect: south- and west-facing slopes
Slope: 15 to 60 percent
Climatic Data:

Depth class: very deep
Drainage class: well drained
Permeability: moderate
Available water capacity: 3.0 to 6.0 inches
Potential rooting depth: 60 inches or more
Runoff: medium to very high
Hazard of erosion by water: severe to very severe

Typical profile:
0 to 7 inches - brown loam
7 to 31 inches – strong brown and light yellowish brown loam
31 to 60 inches - light gray loam

CONTRASTING INCLUSIONS

Soils similar to the Moonville soil but are deep to bedrock and support basin big sagebrush and basin wildrye. (10 percent)

Grassycone soils that support aspens and pinegrass. (5 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITES

Hal Soil

010AY008ID North Slope Loamy 16-20" PPT. ARVA2/FEID (mountain big sagebrush/Idaho fescue)

Moonville Soil

010AY019ID Loamy 12-16" PPT.
ARVA2/PSSS6 (mountain big sagebrush/bluebunch wheatgrass)

12 - Sunsetcone gravelly loam, 30 to 60 percent slopes

COMPOSITION
Sunsetcone soil and similar inclusions - 80 percent
Contrasting inclusions - 20 percent

SETTING

Landform: mountain
Elevation: 5,500 to 6,500 feet
Slope: 30 to 60 percent
Climatic Data:
precipitation - about 18 inches
air temperature - about 40 degrees F
frost-free period - about 50 days

Position on landscape: mountainsides

Depth class: very deep
Drainage class: well drained
Permeability: moderate over rapid
Available water capacity: 5.0 to 7.0 inches
Potential rooting depth: 60 inches or more
Runoff: medium to very high
Hazard of erosion by water: severe to very severe

Typical profile:
0 to 6 inches - brown and dark grayish brown gravelly loam
6 to 10 inches - brown and grayish brown very gravelly loam
10 to 24 inches - brownish yellow very gravelly sandy loam
24 to 40 inches - dark brown cobbles
40 to 60 inches - dark brown gravel

CONTRASTING INCLUSIONS

Soils that are deep to bedrock and support basin big sagebrush and basin wildrye. (10 percent)

Grassycone soils that support aspens and pinegrass. (10 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITE

Sunsetcone Soil
PSME/SYAL (Douglas fir/common snowberry)

13 - Sunsetcone-Grassycone complex, 30 to 50 percent slopes

COMPOSITION

Sunsetcone soil and similar inclusions - 50 percent
Grassycone soil and similar inclusions - 40 percent
Contrasting inclusions - 10 percent

SETTING

Landform: mountains
Elevation: 5,500 to 7,200 feet
Climatic Data:
precipitation - about 18 inches
air temperature - about 40 degrees F
frost-free period - about 50 days

SUNSETCONE SOIL

Position on landscape: mountainsides

Depth class: very deep
Drainage class: well drained
Permeability: moderate over rapid
Available water capacity: 5.0 to 7.0 inches
Potential rooting depth: 60 inches or more

Runoff: medium to very high
Hazard of erosion by water: severe to very severe

Typical profile:
0 to 6 inches - brown and dark grayish brown gravelly loam
6 to 10 inches - brown and grayish brown very gravelly loam
10 to 24 inches - brownish yellow very gravelly sandy loam
24 to 40 inches - dark brown cobbles
40 to 60 inches - dark brown gravel

GRASSYCONE SOIL

Position on landscape: montainsides

Depth class: very deep
Drainage class: well drained
Permeability: moderate
Available water capacity: 11.5 to 14.5 inches
Potential rooting depth: 60 inches or more
Runoff: medium to very high
Hazard of erosion by water: severe to very severe

Typical profile:
0 to 2 inches - dark brown gravelly fine sandy loam
2 to 8 inches - brown gravelly fine sandy loam
8 to 56 inches - dark yellowish brown gravelly fine sandy loam
56 to 65 inches - pale brown cobbly loam

CONTRASTING INCLUSIONS

Soils that are deep to bedrock and support basin big sagebrush and basin wildrye. (10 percent)

Grassycone soils that support aspens and pinegrass. (5 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITES

Sunsetcone Soil

PSME/SYAL (Douglas fir/common snowberry)

Grassycone Soil

010AY007ID POTRT-CARU (quaking aspen/ pine reedgrass)

14 - Goodalfs-Craters association, 0 to 5 percent slopes

COMPOSITION

Goodalfs soil and similar inclusions - 50 percent
Craters soil and similar inclusions - 40 percent
Contrasting inclusions - 10 percent

SETTING

Landform: fan terraces and valley drainageways
Elevation: 5,500 to 6,000
Climatic Data:
precipitation - about 16 inches
air temperature - about 42 degrees F
frost-free period - about 80 days

GOODALFS SOIL

Position on landscape: mountain valley drainageways
Slope: 0 to 1 percent

Depth class: very deep
Drainage class: somewhat poorly drained
Permeability: moderate
Available water capacity: 11.0 to 13.0 inches
Potential rooting depth: 60 inches or more
Ponding: occurs during spring months
Runoff: slow
Hazard of erosion by water: slight

Typical profile:
0 to 24 inches - dark grayish brown and brown silt loam
24 to 40 inches - brown silty clay loam
40 to 60 inches - dark yellowish brown silt loam

CRATERS SOIL

Position on landscape: fan terraces
Slope: 1 to 5 percent

Depth class: very deep
Drainage class: moderately well drained
Permeability: moderate over rapid
Available water capacity: 2.0 to 4.0 inches
Potential rooting depth: 60 inches or more
Runoff: slow
Hazard of erosion by water: slight

Typical profile:
0 to 10 inches - dark grayish brown very gravelly sandy loam
10 to 22 inches - brown very gravelly sandy loam
22 to 60 inches - brown and dark yellowish brown gravelly sandy loam

CONTRASTING INCLUSIONS

Soils less than 10 inches thick to bedrock (10 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITES

Goodalfs Soil

Dominant vegetation in potential natural plant community on the Goodalfs soil is as follows. Grasses consisting of basin wildrye that make up about 90 percent of the plant community. Forbs consisting of mustard, slender wire lettuce and gland cinquefoil that make up about 10 percent of the plant community. Shrubs consisting of mountain big sagebrush that make up a trace of the plant community. Annual production on an air-dry basis in a normal year is about 3,500 pounds per acre.

Craters Soil

Dominant vegetation in potential natural plant community on the Craters soil is as follows. Grasses consisting of basin wildrye and Idaho fescue that make up about 45 percent of the plant community. Forbs consisting of tapertip hawksbeard, yarrow, white stoneseed and lupine that make up about 10 percent of the plant community. Shrubs consisting of mountain big sagebrush and antelope bitterbrush that make up about 45 percent of the plant community. Annual production on an air-dry basis in a normal year is about 1,800 pounds per acre.

15 - Vitale-Blackspar complex, 30 to 60 percent slopes

COMPOSITION

Vitale soil and similar inclusions - 45 percent
Blackspar soil and similar inclusions - 35 percent
Contrasting inclusions - 20 percent

SETTING

Landform: mountains
Elevation: 6,000 to 7,200 feet
Climatic Data:
precipitation - about 16 inches
air temperature - about 40 degrees F
frost-free period - about 50 days

VITALE SOIL

Position on landscape: mountain ridges

Depth class: moderately deep
Drainage class: well drained
Permeability: moderately slow
Available water capacity: 1.5 to 2.5 inches
Potential rooting depth: 20 to 40 inches
Runoff: very high
Hazard of erosion by water: very severe

Typical profile:
0 to 3 inches - grayish brown very stony loam

3 to 10 inches - brown very cobbly loam
10 to 19 inches - brown very cobbly clay loam
19 to 24 inches - brown very cobbly clay loam
24 to 33 inches - light brown very cobbly loam
33 inches - quartzitic siltstone

BLACKSPAR SOIL

Position on landscape: mountainsides

Depth class: shallow
Drainage class: well drained
Permeability: moderate
Available water capacity: 0 .5 to 1.0 inch
Potential rooting depth: 10 to 20 inches
Runoff: medium to very high
Hazard of erosion by water: moderate to very severe

Typical profile:
0 to 6 inches - grayish brown and pale brown very cobbly loam
6 to 12 inches - pale brown extremely cobbly loam
12 inches - quartzitic siltstone

CONTRASTING INCLUSIONS

Dollarhide soils that are on north- and east-facing slopes and support low sagebrush and Idaho fescue. (10 percent)

Rock outcrop on ridges (10 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITES

Vitale Soil

010AY009ID South Slope Gravelly 12-16" PPT. ARVA2/PSSS6 (mountain big sagebrush/bluebunch wheatgrass)

Blackspar Soil

010AY007ID Shallow Stony 8-16" PPT. ARAR8/PSSS6 (low sagebrush/bluebunch wheatgrass)

16 - Lavacreek-Dollarhide complex, 15 to 60 percent slopes

COMPOSITION

Lavacreek soil and similar inclusions - 65 percent
Dollarhide soil and similar inclusions - 25 percent
Contrasting inclusions - 10 percent

SETTING

Landform: mountains
Elevation: 6,000 to 7,200 feet
Climatic Data:
precipitation - about 18 inches
air temperature - about 40 degrees F
frost-free period - about 50 days

LAVACREEK SOIL

Position on landscape: mountainsides
Slope: 30 to 60 percent

Depth class: deep
Drainage class: well drained
Permeability: moderate
Available water capacity: 4.0 to 7.0 inches
Potential rooting depth: 40 to 60 inches
Runoff: medium to very high
Hazard of erosion by water: severe to very severe

Typical profile:
0 to 10 inches - brown very gravelly silt loam
10 to 19 inches - pale brown very gravelly loam
19 to 36 inches - yellowish brown extremely cobbly loam

36 to 59 inches - pale brown extremely cobbly sandy loam
59 inches - fractured quartzitic sandstone

DOLLARHIDE SOIL

Position on landscape: mountain ridgetops
Slope: 15 to 50 percent

Typical profile:
0 to 8 inches - grayish brown very gravelly silt loam
8 to 13 inches - pale brown very gravelly loam
13 inches - fractured quartzitic siltstone

Depth class: shallow
Drainage class: well drained
Permeability: moderately rapid
Available water capacity: 1.5 to 3.0 inches
Potential rooting depth: 10 to 20 inches
Runoff: medium to very high
Hazard of erosion by water: severe to very severe

CONTRASTING INCLUSIONS

Blackspar soils that are on south- and west-facing slopes that support low sagebrush and bluebunch wheatgrass. (5 percent)

Vitale soils that are on south- and west-facing slopes that support mountain big sagebrush, mountain snowberry, and Idaho fescue. (5 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITES

Lavacreek Soil
012XY024ID Subalpine Slope Loamy 20"+ PPT. ARTRVS/FEID (subalpine big sagebrush/Idaho fescue)

Dollarhide Soil

012XY025ID Shallow Subalpine 12-24" PPT. ARAR8/FEID (low sagebrush/Idaho fescue)

17 - Lavacreek-Vitale association, 30 to 60 percent slopes

COMPOSITION

Lavacreek soil and similar inclusions - 45 percent
Vitale soil and similar inclusions - 35 percent
Contrasting inclusions - 20 percent

SETTING
Landform: mountains
Elevation: 6,000 to 7,200 feet
Climatic Data:
precipitation - about 18 inches
air temperature - about 40 degrees F
frost-free period - about 50 days

LAVACREEK SOIL

Position on landscape: mountainsides
Aspect: north-facing and east-facing slopes above 7,000 feet

Depth class: deep
Drainage class: well drained
Permeability: moderate
Available water capacity: 4.0 to 7.0 inches
Potential rooting depth: 40 to 60 inches
Runoff: high
Hazard of erosion by water: severe to very severe

Typical profile:
0 to 10 inches - brown very gravelly silt loam
10 to 19 inches - pale brown very gravelly loam
19 to 36 inches - yellowish brown extremely cobbly loam
36 to 59 inches - pale brown extremely cobbly sandy loam
59 inches - fractured quartzitic sandstone

VITALE SOIL

Position on landscape: mountain ridges
Aspect: south- and west-facing slopes

Depth class: moderately deep
Drainage class: well drained
Permeability: moderate
Available water capacity: 1.5 to 3.0 inches
Potential rooting depth: 20 to 40 inches
Runoff: high to very high
Hazard of erosion by water: severe to very severe

Typical profile:
0 to 3 inches - grayish brown very stony loam
3 to 10 inches - brown very cobbly loam
10 to 19 inches - brown very cobbly clay loam
19 to 24 inches - brown very cobbly clay loam
24 to 33 inches - light brown very cobbly loam
33 inches - quartzitic siltstone

CONTRASTING INCLUSIONS:

Dollarhide soils that are on north- and east-facing slopes that support low sagebrush and Idaho fescue. (10 percent)

Blackspar soils that are on south- and west-facing slopes that support low sagebrush and bluebunch wheatgrass. (5 percent)

Rock outcrop on ridges (5 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITES

Lavacreek Soil

010AY008ID North Slope Loamy 16-20"+ PPT. ARVA2/FEID (mountain big sagebrush/Idaho fescue)

Vitale Soil

010AY009ID South Slope Gravelly 12-16" PPT. ARVA2/PSSS6 (mountain big sagebrush/bluebunch wheatgrass)

18 - Lavacreek-Dollarhide-Grassycone complex, 30 to 60 percent slopes

COMPOSITION

Lavacreek soil and similar inclusions - 45 percent
Dollarhide soil and similar inclusions - 20 percent
Grassycone soil and similar inclusions - 20 percent
Contrasting inclusions - 15 percent

SETTING

Landform: mountains
Elevation: 5,5000 to 7,200 feet
Climatic Data:
precipitation - about 18 inches
air temperature - about 40 degrees F
frost-free period - about 50 days

LAVACREEK SOIL

Position on landscape: mountainsides
Aspect: north- and east-facing slopes
Slope: 30 to 60 percent

Depth class: deep
Drainage class: well drained
Permeability: moderate
Available water capacity: 3.0 to 6.0 inches
Potential rooting depth: 40 to 60 inches
Runoff: medium to high
Hazard of erosion by water: severe to very severe

Typical profile:
0 to 10 inches - brown very gravelly silt loam
10 to 19 inches - pale brown very gravelly loam

19 to 36 inches - yellowish brown extremely cobbly loam
36 to 59 inches - pale brown extremely cobbly sandy loam
59 inches - fractured quartzitic sandstone

DOLLARHIDE SOIL

Position on landscape: mountain ridges
Aspect: north- and east-facing slopes
Slope: 30 to 50 percent

Depth class: shallow
Drainage class: well drained
Permeability: moderately rapid
Available water capacity: 1.5 to 3.0 inches
Potential rooting depth: 10 to 20 inches
Runoff: high to very high
Hazard of erosion by water: severe to very severe

Typical profile:
0 to 8 inches - grayish brown very gravelly silt loam
8 to 13 inches - pale brown very gravelly loam
13 inches - fractured quartzitic siltstone

GRASSYCONE SOIL

Position on landscape: concave positions on mountainsides
Aspect: north- and east-facing slopes
Slope: 30 to 60 percent

Depth class: very deep
Drainage class: well drained
Permeability: moderate
Available water capacity: 12.0 to 15.0 inches
Potential rooting depth: 60 inches or more
Runoff: medium to high
Hazard of erosion by water: moderate to severe

Typical profile:
0 to 2 inches - dark brown fine sandy loam
2 to 8 inches - brown gravelly fine sandy loam
8 to 56 inches - dark yellowish brown gravelly fine sandy loam
56 to 65 inches - pale brown cobbly loam

CONTRASTING INCLUSIONS

Vitale soils that are on south- and west-facing slopes that support mountain big sagebrush, mountain snowberry, and Idaho fescue. (10 percent)

Rock outcrop and talus slopes. (5 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITES

Lavacreek Soil

010AY008ID North Slope Loamy 16-20"+ PPT. ARVA2/FEID (mountain big sagebrush/Idaho fescue)

Dollarhide soil

010AY011ID Shallow Loamy 16-20" PPT. ARAR8/FEID (low sagebrush/Idaho fescue)

Grassycone Soil

010AY016ID Quaking Aspen 20"+ PPT. POTRT-CARU (quaking aspen/pine reedgrass)

19 - Bancroft silt loam, 1 to 4 percent slopes

COMPOSITION

Bancroft soil and similar inclusions - 80 percent
Contrasting inclusions - 20 percent

SETTING

Landform: loess- covered basalt plains

Elevation: 5,200 to 6,000 feet
Climate Data:
precipitation: about 16 inches
air temperature: about 42 degrees F
frost-free season: about 80 days

BANCROFT SOIL

Positions on landscape: concave depressions

Depth class: very deep
Drainage class: well drained
Permeability: moderate
Available water capacity: 11.0 to 14.0 inches
Potential rooting depth: 60 inches or more
Runoff: slow
Hazard of water erosion: slight
Hazard of wind erosion: moderate

Typical profile:
0 to 6 inches - grayish brown silt loam
6 to 12 inches - brown silt loam
12 to 15 inches - brown silt loam
15 to 26 inches - pale brown silt clay loam
26 to 48 inches - light gray silty clay loam
48 to 60 inches – very pale brown silt loam

CONTRASTING INCLUSIONS

McBiggam soils on slightly convex slopes and south-facing slopes (15 percent)

Rock outcrop (5 percent)

MAJOR USES

rangeland
wildlife habitat

ECOLOGICAL SITE

Bancroft Soil

010AY023ID Loamy 12-16" PPT
ARTR4/FEID (threetip sagebrush/Idaho fescue)

20 - McBiggam silt loam, 2 to 8 percent slopes

COMPOSITION

McBiggam soil and similar inclusions - 80 percent
Contrasting inclusions - 20 percent

SETTING

Landform: loess covered basalt plains
Elevation: 5,800 to 6,000 feet
Climate Data:
precipitation: about 16 inches
air temperature: about 42 degrees F
frost-free season: about 80 days

MCBIGGAM SOIL

Positions on landscape: foot slopes

Depth class: very deep
Drainage class: well drained
Permeability: moderately slow
Available water capacity: 8.0 to 12.0 inches
Potential rooting depth: 60 inches or more
Runoff: slow
Hazard of water erosion: slight
Hazard of wind erosion: moderate

Typical profile:
0 to 3 inches - very dark grayish brown silt loam
3 to 15 inches - dark brown silt loam
15 to 26 inches - light yellowish brown silty clay loam
26 to 46 inches - brown silty clay
46 to 80 inches - brown silty clay loam

CONTRASTING INCLUSIONS

Bancroft soils in concave areas (10 percent)

Rock outcrop (10 percent)

MAJOR USES

rangeland

wildlife habitat	**McBiggam Soil**
ECOLOGICAL SITE	010AY004ID ARVA2/FEID (mountain big sagebrush/ Idaho fescue

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of the natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, doughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In the table “Wildlife Habitat,” the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated as good, fair, poor, or very poor. A rating of **good** indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of **fair** indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of **poor** indicates that limitations are severe for the designated

element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of **very poor** indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, wheatgrass, and grama.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountain mahogany, bitterbrush, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features that affect wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features that affect shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs:

Habitat for **openland wildlife** consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for **woodland wildlife** consists of areas of deciduous or coniferous plants, or both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for **wetland wildlife** consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to these areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Habitat for **rangeland wildlife** consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, deer, sage grouse, meadowlark, and lark bunting.

Recreation

The soils in the survey area are rated in the table "Recreational Development" according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites, and either access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season in which it occurs. Onsite assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The soils are rated on the basis of soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Picnic areas are natural or landscaped tracts of land that are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails are areas used for hiking and horseback riding. The areas should require little or no cutting and filling during site preparation. The soils are rated on the basis of soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

The interpretive ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use.

The degree of soil limitation is expressed as slight, moderate, or severe.

Slight means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected.

Moderate means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated slight.

Severe means that soil properties are unfavorable for the rated use. Examples of limitations are slope, bedrock near the surface, flooding, and a seasonal high water table. These limitations generally require major soil reclamation, special design, or intensive maintenance. Overcoming the limitations generally is difficult and costly.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for, sanitary facilities, construction materials, and building site development The ratings are based on observed performance of the soils and on the estimated data and test data in the “Soil Properties” section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data

provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Sanitary Facilities

The table "Sanitary Facilities" shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. It also shows the suitability of the soils for use as a daily cover for landfill.

Soil properties are important in selecting sites for sanitary facilities and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Soil limitation ratings of slight, moderate, or severe are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of good, fair, and poor are given for daily cover for landfill.

A rating of **slight or good** indicates that the soils have no limitations or that the limitations can be easily overcome. Good performance and low maintenance can be expected. A rating of **moderate or fair** indicates that the limitations should be recognized but generally can be overcome by good management or special design. A rating of **severe or poor** indicates that overcoming the limitations is difficult or impractical. Increased maintenance may be required.

Septic tank absorption fields are areas in which subsurface systems of tile or perforated pipe distribute effluent from a septic tank into the natural soil. The centerline of the tile is assumed to be at a depth of 24 inches. Only the part of the soil between depths of 24 and 60 inches is considered in making the ratings. The soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

The table gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function

unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill, trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in the table are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

The table “Construction Materials” gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated good, fair, or poor as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In the table “Construction Materials,” the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table “Engineering Index Properties” provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated **good** contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated **fair** are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated **poor** have one or more of the following characteristics: a plasticity index of more than 10, a high shrink-swell potential, many stones, slopes of more than 25 percent, or a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the table "Construction Materials," only the probability of finding material in suitable quantity in or below the soil is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a **probable source** has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an **improbable source**. Fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated **good** have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated **fair** are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated **poor** are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic

matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Building Site Development

The table "Building Site Development" shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads. The limitations are considered **slight** if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; **moderate** if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and **severe** if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Rangeland

Rangeland makes up about 3,200 acres or 17 percent of the land in the survey area.

Because the area is a National Monument only wildlife graze on native rangeland. The rangeland is used primarily for wildlife habitat, recreational areas, and watershed and has esthetic value.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Rangeland is defined as land on which the native vegetation (the climax, or natural potential, plant community) is predominantly grasses, grasslike plants, forbs, and shrubs suitable for grazing and browsing. Rangeland includes natural grasslands, savannas, many wetlands, some deserts, tundra, and certain shrub and forb communities. Rangeland receives no regular or frequent cultural treatment. The composition and production of the plant community are determined by soil, climate, topography, overstory canopy, and grazing management.

Grazed forest land is defined as land on which the understory includes, as an integral part of the forest plant community, plants that can be grazed without significant impairment of other forest values.

Native pasture is defined as land on which the potential (climax) vegetation is forest but which is used and managed primarily for the production of native forage plants. Native pasture includes cutover forest land and forest land that has been cleared and is managed for native or naturalized forage plants.

The table "Rangeland Productivity and Characteristic Plant Communities" shows for each listed soil, the ecological site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Explanation of the column headings in this table follows.

Ecological site is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other ecological sites in kind, amount, and proportion of rangeland plants.

Many different ecological sites are in the survey area. Over time, the combination of plants best suited to a particular soil and climate has become established. If the soil is not excessively disturbed, this group of plants is the natural plant community for the site. Natural plant communities are not static but vary slightly from year to year and place to place.

The relationship between soils and vegetation was ascertained during this survey; thus, ecological sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of rangeland plants. Soil reaction, salt content, and a seasonal high water table are also important.

Each ecological site is named using general soil or topographic connotations and average annual precipitation. This is followed by a ecological site number to identify the ecological site in lieu of its name. These numbers are used primarily to coordinate ecological sites within and between states. An example of such a number is 010AY020ID. This describes an ecological site in major land resource area 010. If there is a climatic subdivision in the major land resource area an A or B will replace the X in the ecological site number. Some states make a further subdivision of the resource areas. Because Idaho does not, a Y will always appear in the ecological site name. The 020 is the coordinated ecological site number. The letters ID represents the state of Idaho.

In the Craters Of The Moon National Monument Soil Survey Area there are potential natural plant communities in five detailed soil map units that are very limited in size, extent, and distribution. Because of their limited extent, ecological site data were not gathered on these small areas and subsequent "Ecological Site Descriptions" were not written. These sites do not have an ecological site number and name as discussed in this section. Instead, the characteristic species, and their composition and total annual production is given in the section "Detailed Soil Map Unit Descriptions."

Ecological sites in poorer condition may not have the same appearance as the same

ecological site with near potential vegetation. Sagebrush and crested wheatgrass may increase on some sites in poorer condition. They may also invade other sites. The "Field Office Technical Guide," which is available at local offices of the Natural Resources Conservation Service, can provide specific information about Major Land Resource Area maps and ecological sites.

Additional vegetation information is available at The Craters of the Moon National Monument. The National Parks Service has vegetation types mapped out and described in Bulletin Number 38, titled "The Vegetation Types of the Craters of the Moon National Monument"(14). This report describes the plant communities and presents a vegetation type map for the survey area..

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruit of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperature make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation consists of the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil. The plants are listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine various physical and chemical properties (10).

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the rangeland of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

The table "Engineering Index Properties" gives estimates of the engineering

classification and of the rangeland of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in this survey report.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials and the Unified soil classification system(1,2,5).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in

group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

The tables “Physical Properties of the Soils” and “Chemical Properties of the Soils” show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

The following paragraphs describe the columns in the table “Physical Properties of the Soils.”

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in of this survey report.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In the table “Physical Properties of the Soils,” the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ability of a soil to transmit water or air. This has typically been referred to as permeability. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil

characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are low, a change of less than 3 percent; moderate, 3 to 6 percent; and high, more than 6 percent. Very high, more than 9 percent, is sometimes used.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the table "Physical Properties of Soils," the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for plants.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (up to 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in bare or disturbed soil areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

> **1** - Coarse sands, sands, fine sands, and very fine sands. They are extremely erodible, and vegetation is difficult to establish.

2 - Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible.

3 - Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible.

4L - Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. soil

4 - Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible.

5 - Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible.

6 - Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible.

7 - Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. They are very slightly erodible.

8 - Soils that are not subject to soil blowing because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to blowing, or the tons per acre per year that can be expected to be lost to soil blowing. There is a close correlation between soil blowing and the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence soil blowing.

The following paragraphs describe the columns in the table “Chemical Properties of the Soils.”

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Cation-exchange capacity is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. Soils having a high cation-exchange capacity can retain cations. The ability to retain cations helps to prevent the pollution of ground water.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the soil. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is given as the percent, by weight, of hydrated calcium sulfates in the soil.

Gypsum is partially soluble in water and can be dissolved and removed by water. Soils that have a high content of gypsum (more than 10 percent) may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio is the measure of sodium relative to calcium and magnesium in the water extract from saturated soil paste. Soils having a sodium adsorption ratio of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Water Features

The table “Water Features” gives estimates of several important water features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Hydrologic soil groups are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. The soil properties that affect the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include the depth to a seasonal high water table, the intake rate, permeability after prolonged wetting, and the depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation.

Soil Features

The table "Soil Features" gives estimates of several important soil features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Depth to bedrock is given if bedrock is within a depth of 60 inches. The depth is based on many soil borings and on observations during soil mapping. The rock listed as to depth, kind (lithic or paralithic), thickness and hardness (soft or indurated). If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is indurated or massive, blasting or special equipment generally is needed for excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table "Soil Features" shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A **low** potential for frost action indicates that the soil is rarely susceptible to the formation of ice lenses; a **moderate** potential indicates that the soil is susceptible to the formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength; and a **high** potential indicates that the soil is highly susceptible to the formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as **low, moderate, or high**, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as **low, moderate, or high**. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Formation and Classification of the Soils

This section relates the soils in the survey area to the major factors of soil formation and describes the system of soil classification. The classification and extent of the soils in this survey area are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the back of this report.

Formation of the Soils

Climate

Climate has a strong influence on soil formation. Temperature and precipitation influence the rate of weathering and deposition of soil layers. Vegetation available for providing organic matter for soil development is also dependent on temperature and precipitation.

In this survey area the climate is characterized by cool, wet winters and warm, dry summers. Soils below 6,500 feet elevation in this area receive about 16 inches of precipitation per year. Average annual temperatures range from about 43 degrees F in the warmest areas to about 37 degrees F in the coldest parts. Soil development in the drier areas is slow and is characterized by high amounts of cinders.

Soils at elevations of about 6,500 to 7,700 feet have different properties due to an increase in precipitation and decrease in temperatures. These soils are characterized by darker colored surface layers and lighter colored subsoils with differing amounts of carbonates. The darker surface colors are the result of an increase in the amount of organic matter. The lighter subsoil colors are the result of lime being leached to lower depths in the profile. The average annual precipitation ranges from 20 to 24 inches. The average annual air temperature ranges from 37 to 39 degrees F.

Living Organisms

Soil formation is greatly influenced by plant and animal activity. Organic matter, acidity, and bulk density are the soil characteristics most quickly influenced by the kinds of plants and animals present.

The type of vegetation growing on a given soil is dependent on two main factors. The first is the amount and quality of the water available to the plant. The second is the number of frost-free days in the vegetative habitat.

Because of all the volcanic cinders and lava south of the Monument Headquarters, the natural conditions allow only that vegetation which is drought tolerant. This limits the density and variety of grasses that can grow. Consequently, the soils receive very little organic matter, which generally comes primarily from decomposing grass roots, and are light colored throughout.

In the northern part of the survey area, the precipitation is higher and the vegetation is more productive. Consequently, the soils have darker colored surface layers. The grasses are primarily wheatgrasses and bluegrasses. The shrubs are antelope bitterbrush and basin big sagebrush. Plant communities in this part also have significant amounts of forbs, primarily arrowleaf balsamroot.

Relief

Relief in the survey is primarily a result of mountain building activities. This affects microclimate, drainage, and runoff. The survey area is comprised of basalt plains, flood plains, fan terraces, gently rolling to steep foothills, and steep mountains.

Soils on the basalt plains and flood plains have slopes of 0 to about 15 percent.

Soils above the U.S. Highway 93 are primarily mountain soils. These mountains are oriented north and south. Soils on these mountains vary with aspect and landscape

position. Soils on ridge tops are normally very rocky and shallow while those on toe slopes and in swales are very deep and loamy.

Parent Material

The dominant parent materials in the survey area are volcanic ash and cinders, silty alluvium, loess, material weathered from basalt, and colluvium derived from quartzitic sandstone, siltstone, and other quartzitic metamorphic rocks. Volcanic ash and cinders have had the most influence on the soils.

Bedrock in the mountain ranges almost exclusively consists of hard, fractured, Paleozoic sedimentary rock (6).

Soils in the mountainous areas of the survey area are highly variable due to the many types of rocks. Other factors include changes in slope and weathering rates. Limestone, calcareous siltstone, and dolomite have contributed lime to most of the soils in the survey area. Another source of lime is calcareous loess carried by the southwesterly winds scouring the calcareous sediments deposited by ancient lakes.

Some mountain soils have formed in the absence of carbonates. They are well developed, have a high clay content, and/or deep, dark colored surface layers.

Soils that formed in Tertiary igneous material in the southwestern and eastern part of the survey are characteristics due to volcanic ash influences and contain high percentages of volcanic debris from local pyroclastic flows (6).

Time

The degree of soil development is a result of how long a parent material is exposed to other factors. Age of a soil is gauged by development of the layers in the profile. As an example, two soils with similar factors of formation except for time would show differences in the amount of organic matter in the surface, the amount of clay in the subsoil, and depth of soluble minerals such as lime. Landscapes south of the Monument Headquarters have been forming for a short time. Many of the soils in these areas have thin layers of organic matter because of the recent volcanic activity.

Many of the alluvial soils are old enough to have developed a well-defined surface soil and subsoil. At elevations below 6,700 feet, the soils have been developing for a longer time than the soils south of the Headquarters. The alluvial soils vary from very old soils on fan terraces on mountain toe slopes to recent deposits on mountainsides.

Other older soils in the survey area are in the concave positions on mountain slopes. These soils are in swales on north- and east-facing slopes where material being moved downslope during spring runoff is trapped and allowed to develop over time.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (9,13). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in sol. An example is **Andisol.**

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is **Xeand** (**Xer**, meaning dry, plus **and**, from **Andisol**).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree

of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is **Vitrixerands** (**vitri** meaning presence of volcanic glass, plus **xerands** the suborder of the **Andisols** that has a xeric moisture regime).

SUBGROUP. Each great group has a Typic subgroup. Other subgroups are intergrades or extragrades. The Typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective **Typic** identifies the subgroup that typifies the great group. An example is **Typic Vitrixerands**.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is **medial-skeletal, amorphic, frigid Typic Vitrixerands.**

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (11). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (9) and in "Keys to Soil Taxonomy" (13). Unless otherwise indicated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

BANCROFT SERIES

TAXONOMIC CLASS

Fine-silty, mixed, superactive, frigid Calcic Argixerolls

SETTING

Depth class: very deep

Drainage class: well drained

Permeability: moderate

Positions on landscape: depressions and concave areas on basalt plains

Parent material: loess and silty alluvium

Slope range: 1 to 4 percent

Elevation: 5,200 to 6,000 feet

Climatic data (average annual):
*precipitation - 14 to 16 inches
*air temperature - 40 to 45 degrees F
*frost-free period - 60 to 90 days

TYPICAL PEDON DESCRIPTION

A--0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and few medium roots; many very fine interstitial pores; neutral (pH 6.8); abrupt smooth boundary.

AB--6 to 12 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots; common medium and many very fine and fine tubular pores; neutral (pH 7.0); clear smooth boundary.

Bt1--12 to 15 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common very fine and fine roots; many fine and medium tubular pores; few thin clay films on faces of peds; slightly alkaline (pH 7.4); clear smooth boundary.

Bt2--15 to 26 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate coarse and medium subangular blocky; hard, firm, sticky and plastic; common very fine and fine roots; many fine and medium tubular pores; few thin clay films in pores and on faces of peds; neutral (pH 7.2); abrupt wavy boundary.

Bk1--26 to 48 inches; light gray (10YR 7/2) silty clay loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; many fine and medium tubular pores; violent effervescence; strongly alkaline (pH 8.6); gradual wavy boundary.

Bk2--48 to 60 inches; very pale brown (10YR 8/3) silt loam, pale brown (10YR 6/3) moist; massive; hard, friable, slightly sticky, slightly plastic; few fine roots; many fine and medium tubular pores; violent effervescence; strongly alkaline (pH 8.8).

TYPICAL PEDON LOCATION

Butte County, Idaho; about 3 miles southwest of Craters of the Moon National Monument Headquarters; 250 feet west and 2200 feet south of the northeast corner of sec. 19, T. 1 S., R..24 E.; longitude - 113 degrees, 38 minutes, 00 seconds west; latitude - 43 degrees, 19 minutes, 30 seconds north.

RANGE IN CHARACTERISTICS

Profile:
Thickness of mollic epipedon - 10 to 19 inches
Particle-size control section - 18 to 32 percent clay
Depth to calcic horizon - 19 to 40 inches
Average annual soil temperature - 42 to 47 degrees F

A horizons:
Value - 4 or 5 dry, 2 or 3 moist
Chroma - 2 or 3
Organic matter - 2 to 3 percent
Reaction - neutral or slightly alkaline

Bt horizons:
Value - 5 or 6 dry, 3 or 4 moist
Chroma - 2 or 3
Texture - silt loam or silty clay loam
Reaction - neutral to slightly alkaline

Bk horizons:
Value - 7 or 8 dry, 5 or 6 moist
Chroma - 2 or 3
Texture - silt loam or silty clay loam
Clay content - 10 to 30 percent
Calcium carbonate equivalent - 15 to 30 percent

BIGCINDER SERIES

TAXONOMIC CLASS

Ashy-skeletal over fragmental or cindery, aniso, glassy Xeric Vitricryands

SETTING

Depth class: very deep

Drainage class: well drained

Permeability: rapid

Positions on landscape: north facing slopes of cinder cones

Parent material: wind-deposited volcanic ejecta

Slope range: 20 to 40 percent

Elevation: 5,500 to 6,500 feet

Climatic data (average annual):
*precipitation - 14 to 18 inches
*air temperature - 38 to 42 degrees F
*frost-free period - 50 to 70 days

TYPICAL PEDON DESCRIPTION

A1--0 to 2 inches; dark yellowish brown (10YR 3/4) sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium and coarse roots, common very fine tubular pores; 10 percent gravel-size cinders; neutral (pH 7.0); clear smooth boundary.

A2--2 to 6 inches; very dark brown (10YR 2/2) very gravelly sandy loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and common medium and coarse roots; common very fine tubular pores; 40 percent gravel-size cinders; neutral (pH 7.1); clear smooth boundary.

A3--6 to 10 inches; dark brown (10YR 3/3) very gravelly sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; common very fine tubular pores; 45 percent gravel-size cinders; neutral (pH 7.1); clear wavy boundary.

2C--10 to 20 inches; black (10YR 2/1) gravel, black (10YR 2/1) moist; single grained; loose; common very fine and fine and few medium and coarse roots; many very fine to medium and few coarse interstitial pores; 99 percent gravel-size cinders; clear smooth boundary.

3A1--20 to 24 inches; yellowish brown (10YR 5/4) very gravelly loamy sand, dark yellowish brown (10YR 3/4) moist; single grained; loose; few very fine and fine and few medium and coarse roots; common very fine to medium interstitial pores; 45 percent gravel-size cinders; neutral (pH 6.9); clear wavy boundary.

3A2--24 to 30 inches; yellowish brown (10YR 5/4) very gravelly loamy sand, dark yellowish brown (10YR 3/4) moist; single grained; loose; few very fine and fine roots; common very fine to medium interstitial pores; 50 percent gravel-size cinders; neutral (pH 7.0); clear wavy boundary.

4C--30 to 60 inches; black (10YR 2/1) gravel, black (10YR 2/1) moist; single grained; loose; common very fine to medium and few coarse interstitial pores; 99 percent gravel-size cinders.

TYPICAL PEDON LOCATION

Butte County, Idaho: about 1 mile south of the Craters of the Moon National Monument Headquarters Center; 2,200 feet west and

2,200 feet north of the southeast corner of section 12, T. 1 N., R. 24 E.; longitude - 113 degrees, 32 minutes, 33 seconds west, latitude - 43 degrees, 25 minutes, 53 seconds north.

RANGE IN CHARACTERISTICS

Profile:
The soil moisture control section is dry for 60 to 90 consecutive days.
Average annual soil temperature - 40 to 44 degrees F
Average summer soil temperature - 45 to 47 degrees F
Depth to the 2C horizon - 10 to 18 inches
Depth to the 4C horizon - 25 to 40 inches
Mollic epipedon - 10 to 15 inches thick

A horizon:
Hue - 7.5YR or 10YR
Value - 2 through 4 dry, 2 or 3 moist
Chroma, moist - 1 to 3
Coarse fragments - 10 to 45 percent cinders
Glass content - 30 to 50 percent
Phosphate retention - 25 to 50 percent
Acid oxalate aluminum plus one-half the acid oxalate iron - 0.4 to 1.0
15 bar water - 5 to 12 percent dry, and 10 to 20 percent moist

3A horizon:
Hue - 7.5YR or 10YR
Value - 4 or 5 dry, 2 or 3 moist
Chroma - 4 to 6 moist
Coarse fragments - 40 to 60 percent cinders
Texture – Very gravelly loamy sand or very gravelly sandy loam
Glass content - 40 to 70 percent
Phosphate retention - 25 to 40 percent
Acid oxalate aluminum plus one-half the acid oxalate iron - 0.4 to 0.8
15 bar water - 3 to 10 percent dry and - 5 to 15 percent moist

2C and 4C horizons:
Rock fragments - 90 to 100 percent cinders

BLACKSPAR SERIES

TAXONOMIC CLASS

Loamy-skeletal, mixed, superactive, frigid Lithic Mollic Haploxeralfs

SETTING

Depth class: shallow

Drainage class: well drained

Permeability: moderate

Positions on landscape: mountainsides

Parent material: residuum and colluvium derived from siltstone and quartzitic sandstone

Slope range: 30 to 60 percent

Elevation: 6,000 to 7,200 feet

Climatic data (average annual):
*precipitation - 14 to 18 inches
*air temperature - 38 to 42 degrees F
*frost-free period - 50 to 70 days

TYPICAL PEDON DESCRIPTION

A1--0 to 2 inches; grayish brown (10YR 5/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; 25 percent gravel and 25 percent cobbles; neutral (pH 7.0); clear wavy boundary.

A2--2 to 6 inches; pale brown (10YR 6/3) very cobbly loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine and common medium roots; common very fine and fine tubular pores; 20 percent gravel and 35 percent cobbles; neutral (pH 7.2); gradual wavy boundary.

Bt--6 to 12 inches; pale brown (10YR 6/3) extremely cobbly loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine and medium roots; common irregular pores; few thin clay films on faces of peds and in pores; 30 percent gravel and 40 percent cobbles; neutral (pH 7.3); abrupt clear boundary.

R--12 inches; quartzitic siltstone.

TYPICAL PEDON LOCATION

Butte County, Idaho; about 16 miles west and 8 miles south of Arco, Idaho; 450 feet south and 800 feet west of the northwest corner of section 17 T. 2 N., R..24 E.; latitude - 43 degrees, 30 minutes, 46 seconds north; longitude - 113 degrees, 36 minutes, 58 seconds west

RANGE IN CHARACTERISTICS

Profile:
Average annual soil temperature - 42 to 45 degrees F
Depth to bedrock - 10 to 20

Particle size control section
Clay - 20 to 30 percent
Rock fragments - 35 to 75 percent

A horizon:
Value - 5 or 6 dry and 2 or 3 moist

Bt horizons:
Hue - 10YR or 7.5YR
Value - 5 or 6 dry
Chroma - 3 or 4 moist

CINDERHURST SERIES

TAXONOMIC CLASS

Medial-skeletal, amorphic, frigid Lithic Vitrixerands

SETTING

Depth class: extremely to very shallow

Drainage class: well drained

Permeability: moderate

Positions on landscape: lava plains and recent lave flows

Parent material: wind deposited volcanic tephra

Slope range: 2 to 15 percent

Elevation: 4,800 to 6,000 feet

Climatic data (average annual):
*precipitation - 14 to 16 inches
*air temperature - 40 to 45 degrees F
*frost-free period - 60 to 90 days

TYPICAL PEDON DESCRIPTION

A--0 to 3 inches; brown (10YR 4/3) extremely cobbly silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine interstitial pores; about 50 percent cobbles and 15 percent gravel; slightly acid (pH 6.2); clear smooth boundary.

Bw--3 to 8 inches; yellowish brown (10YR 5/4) very cobbly silt loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine medium and coarse roots; common very fine tubular pores; about 35 percent cobbles and 5 percent pebbles; slightly acid (pH 6.4).

2R--8 inches; basalt with vertical fractures 0.5 to 2 cm wide (1 to 3 meters apart) with B material in cracks; few very fine, fine and medium roots in cracks.

TYPICAL PEDON LOCATION

Blaine County, Idaho; about 15 miles east and 6 miles north of Carey; 1,800 feet north and 50 feet west of the SE corner of sec. 19, T. 1 N., R. 24 E.; latitude - 43 degrees, 23 minutes, 04 seconds north; longitude -113 degrees, 38 minutes, 15 seconds west.

RANGE IN CHARACTERISTICS

Profile:
The soil moisture control section is dry for 100 to 120 consecutive days.
Depth to basalt bedrock - 1 to 10 inches
Mean annual soil temperature - 42 to 47 degrees F
Reaction - slightly acid to neutral throughout

Andic soil properties:-
Phosphate retention is 50 to 80 percent
Acid oxalate aluminum plus one-half the iron is 1.0-2.0
15-bar water - 12 to 15 percent dry, and 20 to 30 percent moist
Glass content - 5 to 30 percent

O horizon - 1/2 to 1 inch thick in some pedons

A horizon:
Value - 4 or 5 dry
Chroma - 2 through 4 moist or dry
Rock fragments - 60 to 75 percent

Bw horizon:
Hue - 10YR, 7.5YR
Value - 4 to 6 dry, 3 or 4 moist
Chroma - 3 or 4 moist or dry
Texture – very cobbly silt loam, very gravelly silt loam, extremely cobbly loam, extremely cobbly silt loam
Rock fragments - 40 to 70 percent
Field estimated clay content - 18 to 25 percent

CRATERS SERIES

TAXONOMIC CLASS

Medial, amorphic, frigid Humic Vitrixerands

SETTING

Depth class: very deep

Drainage class: moderately well drained

Permeability: moderate

Positions on landscape: fan terraces

Parent material: reworked ash

Slope range: 1 to 5 percent

Elevation: 5,500 to 6,000 feet

Climatic data (average annual):
*precipitation - 14 to 18 inches
*air temperature - 40 to 45 degrees F
*frost-free period - 60 to 90 days

TYPICAL PEDON DESCRIPTION

A1--0 to 4 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and medium roots; many very fine interstitial pores; 35 percent gravel-size cinders; neutral (pH 7.0); clear wavy boundary.

A2--4 to 10 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine and medium roots; common medium, many very fine and fine tubular pores; 45 percent gravel-size cinders; neutral (pH 7.2); clear smooth boundary.

Bw1--10 to 22 inches; brown (10YR 4/3) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine

subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots; many fine and medium tubular pores; 35 percent gravel-size cinders; neutral (pH 7.3); clear smooth boundary.

Bw2--22 to 38 inches; brown (10YR 4/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine roots; many fine and medium tubular pores; 25 percent gravel-size cinders; slightly alkaline (pH 7.4); clear smooth boundary.

Bw3--38 to 60 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; many fine and medium tubular pores; 20 percent gravel-size cinders; slightly alkaline (pH 7.5).

TYPICAL PEDON LOCATION

Butte County, Idaho; 3/4 mile north of Craters of the Moon National Monument Headquarters; 1,500 feet west and 2,200 feet south of the northeast corner, sec. 27, T. 2 N., R. 24 E.; longitude - 113 degrees, 34 minutes, 48 seconds west; latitude - 43 degrees, 28 minutes, 28 seconds north.

RANGE IN CHARACTERISTICS

Andic soil properties are present throughout the profile:
Glass content - 5 to 30 percent
Phosphate retention - 50 to 80
Acid oxalate aluminum plus one-half the acid oxalate iron - 1.0 to 2.0
15 bar water - 12 to 15 percent dry, and 20 to 30 percent moist
Mollic epipedon - 20 to 40 inches thick
Particle-size control section - averages 15 to 35 percent cinders
Mean annual soil temperature - 42 to 47 degrees F
The soil moisture control section is dry for 90 to 120 days

A horizon:
Value - 3 or 4 dry, 2 or 3 moist
Chroma - 2 or 3 dry or moist
Rock fragment - 35 to 50 percent cinders

Bw horizon:
Value - 3 or 4 dry, 2 or 3 moist
Chroma - 2 through 4 dry or moist; moist chromas of 4 occur below a depth of 20 or more inches
Reaction - neutral to slightly alkaline
Texture – gravelly sandy loam, gravelly loam, very gravelly sandy loam, very gravelly loam
Rock fragment content - 15 to 40 percent cinders

DOLLARHIDE SERIES

TAXONOMIC CLASS

Loamy-skeletal, mixed, superactive Lithic Haplocryolls

SETTING

Depth class: shallow

Drainage class: well drained

Permeability: moderately rapid

Positions on landscape: ridgetops on foothills and mountainsides

Parent material: loess and residuum, colluvium derived from siltstone and quartzitic sandstone

Slope range: 15 to 60 percent

Elevation: 6,000 to 7,200 feet

Climatic data (average annual):
*precipitation - 16 to 20 inches

*air temperature - 37 to 43 degrees F
*frost-free period - 30 to 70 days

TYPICAL PEON DESCRIPTION

A--0 to 8 inches; grayish brown (10YR 5/2) very gravelly silt loam, brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable; many very fine and fine roots; common very fine and fine interstitial pores; 35 percent gravel and 5 percent cobbles; neutral (pH 6.8); clear smooth boundary.

Bw--8 to 13 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable; common very fine, fine and medium roots; common very fine and fine interstitial pores; 30 percent gravel and 15 percent cobbles; neutral (pH 7.0); abrupt wavy boundary.

2R1--13 to 16 inches; fractured quartzite; vertical and horizontal fractures 1 to 2 millimeters wide; soil material in less than 5 percent of fractures; common very fine and fine roots along fracture planes.

2R2--16 inches; bedrock.

TYPICAL PEDON LOCATION

Butte County, Idaho; about 10 miles north and about 11 miles west of the Craters of the Moon National Monument Headquarters; 500 feet south and 2,150 feet west of the northwest corner of section 26, T.3 N., R.23 E.; latitude - 43 degrees, 34 minutes, 15 seconds north; longitude - 113 degrees, 41 minutes, 09 seconds west

RANGE IN CHARACTERISTICS

Profile:
Average annual soil temperature - 38 to 43 degrees F
Average summer soil temperature - 54 to 59 degrees F
Thickness of the mollic epipedon- 7 to 10 inches
Depth to bedrock - 10 to 20 inches

Particle size control section:
Clay - 8 to 18 percent
Rock fragments - 45 to 70 percent

A horizon:
Value - 4 or 5 dry, 3 or 4 moist
Chroma - 2 or 3 dry or moist

Bw horizons:
Value - 4 or 6 dry, 3 or 4 moist
Texture - very gravelly loam or extremely cobbly loam

ECHOCRATER SERIES

TAXONOMIC CLASS

Ashy-skeletal over fragmental or cindery, glassy, frigid Typic Vitrixerands

SETTING

Depth class: very deep

Drainage class: well drained

Permeability: rapid

Position on landscape: south-facing slopes on cinder cones

Parent material: recent volcanic ash and cinders

Slope range: 20 to 40 percent

Elevation: 5,800 to 7,500 feet

Climatic data (average annual):
*precipitation – 14 to 18
*air temperature – 40 to 45 degrees F
*frost-free period – 60 to 90 days

TYPICAL PEDON DESCRIPTION

A1--0 to 3 inches; dark grayish brown (10YR 4/3) gravelly loamy sand, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine, fine and few medium roots; common very fine interstitial pores; 20 percent gravel-size cinders; slightly alkaline (pH 7.4); clear smooth boundary.

A2--3 to 8 inches; dark grayish brown (10YR 4/3) gravelly loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and few medium roots; common very fine tubular pores; 25 percent gravel-size cinders; slightly alkaline (pH 7.4); clear smooth boundary.

Bw--8 to 15 inches; brown (10YR 4/3) very gravelly loamy sand, dark yellowish brown (10YR 3/4) moist; weak fine subangular blocky structure; slightly hard, firm, nonsticky and nonplastic; few very fine and fine roots; common very fine tubular pores; 45 percent gravel-size cinders; slightly alkaline (pH 7.4); clear wavy boundary.

2BC--15 to 25 inches; very dark brown (10YR 2/2) very gravelly loamy sand, black (10YR 2/1) moist; massive; loose; few very fine and fine roots; common very fine, fine and few medium interstitial pores; 50 percent gravel-size cinders; slightly alkaline (pH 7.5); clear wavy boundary.

2C--25 to 60 inches; very dark brown (10YR 2/2) gravel, black (10YR 2/1) moist; single grained; loose; common very fine to medium and few coarse interstitial pores; 90 percent gravel-size cinders.

TYPICAL PEDON LOCATION

Butte County, Idaho; 1,900 feet east and 1,200 feet south of the northwest corner of section 29, T. 1 N., R. 25 E.; longitude - 113 degrees, 57 minutes, 00 seconds west; latitude - 43 degrees, 23 minutes, 34 seconds north.

RANGE IN CHARACTERISTICS

Profile:
Depth to the 2C horizon is 20 to 35 inches

Andic soil properties (A, Bw, 2BC horizons):
- Glass content - 40 to 70 percent
- Phosphate retention -25 to 40
- Acid oxalate extractable aluminum plus one-half the acid oxalate iron - 0.4 to 0.8
- 15 bar water - 3 to 10 percent dry and 5 to 15 percent moist

Average annual soil temperature - 42 to 47 degrees F
The moisture control section is dry for 90 to 120 days

A horizon:
Value - 4 or 5 dry, 3 or 4 moist
Chroma - 2 or 3 moist
Coarse fragments - 15 to 30 percent cinders
Organic matter - 1 to 4 percent

Bw horizon:
Value - 3 or 4 dry, 2 or 3 moist
Chroma - 2 through 4 dry or moist
Coarse fragments - 40 to 50 percent cinders
Organic matter - less than 1 percent

2BC horizon:
Value - 2 or 3 dry, 2 or 3 moist
Chroma - 1 or 2 dry or moist
Coarse fragments - 45 to 65 percent cinders

2C horizon:
Coarse fragments - 90 to 100 percent cinders

GOODALFS SERIES

TAXONOMIC CLASS

Fine-loamy, mixed, superactive, frigid Vitriandic Hapolxerolls

SETTING

Depth class: very deep

Drainage class: somewhat poorly drained

Permeability: moderate

Positions on landscape: mountain valley drainageways

Parent material: loess and silty alluvium

Slope range: 0 to 1 percent

Elevation: 5,500 to 6,000 feet

Climatic data (average annual):
*precipitation - 14 to 18 inches
*air temperature - 40 to 45 degrees F
*frost-free period - 60 to 90 days

TYPICAL PEDON DESCRIPTION

A--0 to 3 inches; dark grayish brown (10YR 4/2) silt loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine interstitial pores; neutral (pH 7.0); clear wavy boundary.

Bw1--3 to 10 inches; brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and medium roots; common medium, many very fine and fine tubular pores; neutral (pH 7.2); clear smooth boundary.

Bw2--10 to 24 inches; brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine and fine roots; many fine and medium tubular pores; neutral (pH 7.3); clear smooth boundary.

Bw3--24 to 40 inches; brown (10YR 4/3) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; common fine roots; many fine and medium tubular pores; slightly alkaline (pH 7.4); clear smooth boundary.

Bw4--40 to 60 inches; dark yellowish brown (10YR 4/4) silt loam, dark brown (10YR 3/3) moist; massive; hard, friable, moderately sticky and moderately plastic; few fine roots; many fine and medium tubular pores; slightly alkaline (pH 7.5).

TYPICAL PEDON LOCATION

Butte County, Idaho; 3/4 mile north of Craters of Moon National Monument Headquarters; 1,300 feet west and 1,900 feet north of the southeast corner, sec. 27, T. 2 N., R. 24 E. ;longitude - 113 degrees, 34 minutes, 45 seconds west; latitude - 43 degrees, 28 minutes, 21 seconds north

RANGE IN CHARACTERISTICS:

Profile:
The soil moisture control section is dry for 80 to 100 consecutive days.
Particle-size control section - 18 to 32 percent clay
Mean annual soil temperature - 42 to 47 degrees F
Mollic epipedon - 20 to 30 inches thick

A horizon:
Value - 3 or 4 dry, 2 or 3 moist
Chroma - 1 or 2 dry or moist
Organic matter - 2 to 4 percent.
Glass content - 5 to 30 percent
Phosphate retention - 50 to 80 percent
Acid oxalate aluminum plus one-half the acid oxalate iron - 1.0 to 2.0
15 bar water - 12 to 15 percent dry, 20 to 30 percent moist

Bw horizon:

Value - 3 or 4 dry, 2 or 3 moist
Chroma - 2 or 3 moist and 3 or 4 dry
Texture – silt loam, silty clay loam
Reaction - neutral to slightly alkaline
Organic matter - 0.5 to 2 percent and decreases irregularly with depth
Glass content - 5 to 15 percent
Phosphate retention is 10 to 30 percent
Acid oxalate aluminum plus one-half the acid oxalate iron 0.4 to 1.3

GRASSYCONE SERIES

TAXONOMIC CLASS

Medial, amorphic Xeric Vitricryands

SETTING

Depth class: very deep

Drainage class: well drained

Permeability: rapid

Positions on landscape: concave areas on foothills and mountainsides

Parent material: recent volcanic ash

Slope range: 30 to 60 percent

Elevation: 6,000 to 7,200 feet

Climatic data (average annual):
*precipitation - 16 to 20 inches
*air temperature - 37 to 43 degrees F
*frost-free period - 30 to 70 days

TYPICAL PEDON DESCRIPTION

Oi--1/2 inch to 0; aspen leaves and heavy root mats

A1--0 to 2 inches; dark brown (10YR 3/3) fine sandy loam, black (10YR 2/1) moist; strong fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; about 10 percent cinders; neutral (pH 7.2); clear smooth boundary.

A2--2 to 8 inches; brown (10YR 4/3) gravelly fine sandy loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine common medium and coarse roots; about 15 percent cinders; neutral (pH 7.0); gradual smooth boundary.

Bw--8 to 56 inches; dark yellowish brown (10YR 4/4) gravelly fine sandy loam, dark brown (7.5YR 3/4) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine, fine and few coarse roots; many very fine and fine tubular pores; about 25 percent cinders and a trace of cobbles; neutral (pH 6.8); clear wavy boundary.

2C--56 to 65 inches; pale brown (10YR 6/3) cobbly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; many very fine tubular pores; about 15 percent gravel and 15 percent cobbles; neutral (pH 6.6).

TYPICAL PEDON LOCATION

Butte County, Idaho; about 3 1/2 miles north and 2 1/2 miles west of the Craters of the Moon National Monument Headquarters; about 17 miles west of Arco, Idaho; 1,300 feet west of the southeast corner of section. 8, T.2 N., R.24E.; latitude - 43 degrees, 30 minutes, 33 seconds north; longitude - 113 degrees, 37 minutes, 18 seconds west

RANGE IN CHARACTERISTICS

Profile:
Average annual soil temperature - 37 to 44 degrees F
Particle size control section:
Clay - 5 to 25 percent
Cinders - 5 to 30 percent

Rock fragments - 0 to 5 percent

Andic soil properties:
Phosphate retention – 50 to 80 percent
Glass count – 5 to 30 percent
15-bar water -12 to 15 percent dry and 20 to 30 percent moist
Acid-oxalate aluminum plus one-fifth the iron – 1.0 to 2.0

A horizons:
Hue - 10YR or 7.5YR
Value - 3 through 5 dry and 2 or 3 moist
Chroma - 2 or 3 dry and 1 through 3 moist

Bw horizons:
Hue - 10YR or 7.5YR
Value - 4 or 5 dry and 3 or 4 moist
Chroma - 4 through 6
Coarse fragments – 25 to 35 percent

2C horizon: - not be present in all profiles. It is very cobbly or cobbly loam or clay loam with 24 to 30 percent clay.
Cinders - 5 to 30 percent
Rock fragments - 0 to 5 percent

HAL SERIES

TAXONOMIC CLASS

Medial, amorphic Xeric Vitricryands

SETTING

Depth class: very deep

Drainage class: well drained

Permeability: moderate over rapid

Positions on landscape: concave areas on foothills and mountainsides

Parent material: wind deposited volcanic ash and cinders

Slope range: 30 to 60 percent
Elevation: 6,000 to 7,200 feet

Climatic data (average annual):
*precipitation - 16 to 20 inches
*air temperature - 37 to 43 degrees F
*frost-free period - 30 to 70 days

TYPICAL PEDON DESCRIPTION

A1--0 to 6 inches; brown (10YR 4/3) gravelly loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; common fine tubular pores; about 15 percent gravel-sized cinders; neutral (pH 6.6); clear smooth boundary.

A2--6 to 12 inches; brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/4) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine and few medium roots; many very fine and fine tubular pores; about 20 percent gravel-sized cinders; neutral (pH 6.8); clear wavy boundary.

Bw1--12 to 24 inches; brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/4) moist; weak coarse prismatic structure parting to moderate medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine, fine and few medium roots; common very fine tubular pores; about 25 percent gravel-sized cinders; neutral (pH 6.8); gradual wavy boundary.

Bw2--24 to 40 inches; brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/4) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine, fine and medium roots; few very fine tubular pores; about 30 percent gravel-sized cinders; neutral (pH 6.9); abrupt wavy boundary.

2C--40 to 60 inches; very dark brown (10YR 2/2) extremely gravelly loamy coarse sand, very dark brown (10YR 2/2) moist; single grained; loose, nonsticky and nonplastic;

about 80 percent gravel-sized cinders; neutral (pH 7.0).

TYPICAL PEDON LOCATION

Butte County, Idaho; about 1 1/2 miles north and 1/2 miles west of the Craters of the Moon National Monument Headquarters; about 17 miles west of Arco, Id; 800 feet east and 1,100 feet north of the southwest corner of section. 23, T.2 N., R.24 E., Latitude - 43 degrees, 29 minutes, 03 seconds north Longitude - 113 degrees, 34 minutes, 17 seconds west

RANGE IN CHARACTERISTICS

Profile:
The soil moisture control section is dry for 60 to 90 consecutive days.
Average annual soil temperature - 38 to 44 degrees F
The solum and depth to the 2C horizon is 40 to over 60 inches.
Bulk density (moist) - 0.9 to 1.0 g/cm 3.

Andic soil properties:
Phosphate retention - 50 to 80 percent.
15 bar water - 12 to 15 percent dry and 20 to 30 percent moist
acid-oxalate aluminum plus one-half the iron- 1.0 - 2.0
Glass content - 5 to 30 percent

Particle size control section:
Clay - 5 to 15 percent
Cinders - 5 to 30 percent

A horizons:
Hue - 10YR or 7.5YR
Value - 3 through 5 dry and 2 through 4 moist
Chroma - 3 or 4 dry and 2 or 3 moist

Bw horizons:
Hue - 10YR or 7.5YR
Value - 4 or 5 dry and 3 or 4 moist
Chroma - 4 through 6
2C horizon: - (when present)
Rock fragments – 60 to 90 percent (cinders)
Dark color due to parent material, not organic matter

INFERNOCONE SERIES

TAXONOMIC CLASS

Ashy-skeletal over fragmental or cindery, glassy, frigid Humic Vitrixerands

SETTING

Depth class: very deep

Drainage class: well drained

Permeability: rapid

Positions on landscape: north-facing slopes and toe slopes of cinder cones

Parent material: recent volcanic ash and cinders from Craters of the Moon volcanics

Slope range: 2 to 40 percent

Elevation: 6,000 to 8,500 feet

Climatic data (average annual):
*precipitation - 14 to 18 inches
*air temperature - 40 to 45 degrees F
*frost-free period - 60 to 90 days

TYPICAL PEDON DESCRIPTION

A1--0 to 5 inches; dark brown (10YR 3/3) gravelly sandy loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and few medium roots; common very fine tubular pores; 20 percent gravel-size cinders; slightly alkaline (pH 7.4); clear smooth boundary.

A2--5 to 10 inches; dark brown (10YR 3/3) gravelly sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft,

very friable, nonsticky and nonplastic; common very fine, fine, and few medium roots; common very fine tubular pores; 25 percent gravel-size cinders, slightly alkaline (pH 7.4); clear smooth boundary.

Bw--10 to 25 inches; dark yellowish brown (10YR 3/4) gravelly sandy loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; slightly hard, firm, nonsticky and nonplastic; few very fine and fine roots; common very fine tubular pores; 25 percent gravel-size cinders; slightly alkaline (pH 7.4); gradual wavy boundary.

2BC--25 to 35 inches; very dark brown (10YR 2/2) very gravelly sandy loam, black (10YR 2/1) moist; massive; slightly hard, firm, nonsticky and nonplastic; few very fine roots; common very fine tubular pores; 50 percent gravel-size cinders; slightly alkaline (pH 7.5); clear smooth boundary.

2C--35 to 60 inches; very dark brown (10YR 2/2) gravel, black (10YR 2/1) moist; single grained; loose; common very fine to medium few coarse interstitial pores; 90 percent gravel-size cinders.

TYPICAL PEDON LOCATION

Butte County, Idaho: about 1.5 miles south of the Craters of the Moon National Monument Headquarters; 1,800 feet east and 600 north of the southwest corner of section 18, T. 1 N., R. 25 E.; longitude - 113 degrees, 31 minutes, 44 seconds west; latitude - 43 degrees, 23 minutes, 33 seconds north.

RANGE IN CHARACTERISTICS

Profile:
Average annual soil temperature - 42 to 47 degrees F
The soil moisture control section is dry for 90 to 120 days
Depth to the 2C horizon - 25 to 40 inches
Mollic epipedon - 10 to 15 inches thick
Andic soil properties (A, Bw, 2BC horizons):
Glass content - 30 to 50 percent
Phosphate retention - 25 to 50
Acid oxalate aluminum plus one-half the acid oxalate iron - 0.4 to 1.0
15 bar water - 5 to 12 percent dry and 10 to 20 percent moist

A horizon:
Value - 3 or 4 dry, 2 or 3 moist
Chroma - 1 to 3 moist
Coarse fragments - 15 to 30 percent cinders
Organic matter - 1 to 4 percent

Bw horizon:
Value - 3 or 4 dry, 2 or 3 moist
Chroma - 2 through 4 dry or moist
Coarse fragments - 25 to 35 percent cinders
Organic matter - less than 1 percent

2BC horizon:
Value - 2 or 3 dry, 2 or 3 moist
Chroma - 1 or 2 dry or moist
Coarse fragments - 45 to 65 percent cinders
Textures – very gravelly sandy loam, very gravelly loamy sand

2C horizon:
Coarse fragments - 90 to 100 percent cinders

LAVACREEK SERIES

TAXONOMIC CLASS

Medial-skeletal, amorphic Xeric Vitricryands

SETTING

Depth class: deep

Drainage class: well drained

Permeability: moderate

Positions on landscape: mountainsides

Parent material: mantle of volcanic tephra over colluvium derived from quartzitic sandstone and siltstone

Slope range: 15 to 60 percent

Elevation: 6,000 to 7,200 feet

Climatic data (average annual):
*precipitation - 16 to 20 inches
*air temperature - 37 to 43 degrees F
*frost-free period - 30 to 70 days

TYPICAL PEDON DESCRIPTION

A--0 to 10 inches; brown (10YR 5/3) very gravelly silt loam, brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and nonplastic; many very fine and fine roots; common very fine interstitial pores; 25 percent gravel and 20 percent cobbles; neutral (pH 6.6); clear smooth boundary.

Bw1--10 to 19 inches; pale brown (10YR 6/3) very gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular structure; slightly hard, very friable, slightly sticky and nonplastic; many very fine, fine and common medium roots; common very fine interstitial pores; 30 percent gravel and 25 percent cobbles; neutral (pH 6.6); gradual wavy boundary.

Bw2--19 to 36 inches; yellowish brown (10YR 5/4) extremely cobbly loam, dark yellowish brown (10YR 3/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; many very fine, fine and common medium roots; common very fine interstitial pores; 30 percent gravel and 35 percent cobbles; neutral (pH 6.7); clear wavy boundary.

BC--36 to 42 inches; pale brown (10YR 6/3) extremely cobbly sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine, common fine and medium roots; common very fine tubular pores; 40 percent gravel and 40 percent cobbles; few discontinuous bleached sand and silt grains on faces of peds; neutral (pH 6.7); gradual wavy boundary.

2C--42 to 59 inches; pale brown (10YR 6/3) extremely cobbly sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; common very fine, fine and medium roots; common very fine tubular pores; 40 percent gravel and 40 percent cobbles; neutral (pH 6.8); diffuse irregular boundary.

2R--59 inches; fractured quartzite; less than 5 percent C horizon material in fractures.

TYPICAL PEDON LOCATION

Butte County, Idaho; about 10 miles north and about 11 miles west of the Craters of the Moon National Monument Headquarters; 1,850 feet south and 1,650 feet west of the northwest corner of section 26, T.3 N., R.23 E.; latitude - 43 degrees, 33 minutes, 57 seconds north; longitude - 113 degrees, 41 minutes, 13 seconds west

RANGE IN CHARACTERISTICS

Profile:
Average annual soil temperature - 37 to 43 degrees F
Average summer soil temperature - 54 to 59 degrees F
Thickness of the mollic - 10 to 23 inches
Depth to bedrock - 40 to 60 inches
Bulk density (at 1/3 bar water tension) - 0.95 g/cm or less in the upper 30 inches.

Andic soil properties:
Phosphate retention - 50 to 80 percent
Glass content- 5 to 30 percent
15 bar water, dry - 12 to 15 percent
15 bar water, moist - 20 to 30 percent
Acid-oxalate aluminum plus one-half the iron - 1.0 to 2.0

Particle size control section:
Rock fragments - 45 to 80 percent

A horizon:
Value - 3 through 5 dry, 2 or 3 moist
Chroma - 3 or 4 dry or moist

Bw horizon:
Hue - 7.5YR or 10YR
Value - 4 through 6 dry
Chroma - 3 or 4 dry or moist
Texture - very gravelly loam, very cobbly loam or extremely cobbly loam
Rock fragments – 50 to 65 percent

2C horizon:
Value - 5 or 6 dry
Texture - very gravelly loam, extremely gravelly loam or extremely cobbly sandy loam
Rock fragments - 35 to 80 percent

MCBIGGAM SERIES

TAXONOMIC CLASS

Fine-silty, mixed, superactive, frigid Typic Palexerolls

SETTING

Depth class: very deep

Drainage class: well drained

Permeability: slow

Positions on landscape: foot slopes on basalt plains

Parent material: loess and material weathered from basalt

Slope range: 2 to 8 percent

Elevation: 5,800 to 6,000 feet

Climatic data (average annual):
*precipitation - 14 to 16 inches
*air temperature - 40 to 45 degrees F
*frost-free period - 60 to 90 days

TYPICAL PEDON DESCRIPTION

A1--0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, very dark brown (10YR 2/2) moist; moderate very fine granular structure; soft, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine interstitial pores; about 10 percent gravel-size cinders; neutral (pH 6.4); clear smooth boundary.

A2--3 to 10 inches; dark brown (10YR 3/3) silt loam, very dark brown (10YR 2/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine, fine and medium roots; many very fine interstitial pores; about 10 percent gravel-size cinders; neutral (pH 6.6); clear smooth boundary.

BA--10 to 15 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; strong fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine and medium roots; many very fine, fine and medium tubular pores; neutral (pH 7.0); clear smooth boundary.

Bt--15 to 26 inches; light yellowish brown (10YR 6/4) silty clay loam, dark brown (10YR 4/3) moist; strong fine and medium angular blocky structure; hard, firm, moderately sticky and moderately plastic; common very fine, fine and medium roots; common very fine and fine tubular pores; few faint clay films on faces of peds and lining pores; few thin bleached sand and silt grains on faces of peds; about 5 percent cobbles and 5 percent gravel at lower boundary; neutral (pH 7.0); abrupt smooth boundary.

2Btb--26 to 36 inches; brown (7.5YR 4/2) silty clay, dark brown (7.5YR 3/4) moist; strong medium and coarse prismatic structure; very hard, very firm, very sticky and moderately plastic; common very fine and fine roots; few very fine tubular pores;

many continuous slickensides on faces of peds and many distinct clay films lining pores; slightly alkaline (pH 7.4); abrupt wavy boundary.
2Btkb--36 to 46 inches; brown (7.5YR 4/4) silty clay, dark brown (7.5YR 3/4) moist; strong medium angular blocky structure; very hard, very firm, very sticky and moderately plastic; few very fine and fine roots; common very fine tubular pores; many continuous slickensides on faces of peds and common distinct clay films lining pores; strongly effervescent on faces of peds, slightly effervescent in matrix; slightly alkaline (pH 7.8); clear wavy boundary.

2Bkb--46 to 80 inches; brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; massive; hard, firm, moderately sticky and moderately plastic; few fine roots; few fine tubular pores; nearly continuous pinkish white (7.5YR 8/2) lime coating on ped faces and in pores; strongly effervescent; slightly alkaline (pH 8.2).

TYPICAL PEDON LOCATION

Blaine County, Idaho; about 2 miles north and 18 miles east of Carey, Idaho; 2,500 feet east and 400 feet north of the southwest corner, sec. 15, T. 1 S. R. 24 E.

RANGE IN CHARACTERISTICS

Profile:
Depth to buried subsoil - 22 to 36 inches
Mean annual soil temperature - 42 to 45 degrees F
Reaction - Slightly acid to slightly alkaline
Thickness of mollic epipedon - 11 to 15 inches
Clay content - upper 20 inches of argillic horizon averages 27 to 35 percent

A horizons:
Value - 3 to 5 dry, 2 or 3 moist
Chroma - 2 or 3 moist or dry

Bt horizons:
Value - 4 to 6 dry
Chroma - 3 or 4 moist or dry
Percent clay content - 26 to 32
Percent rock fragments - 5 to 10

2Btb and 2Btkb horizons:
Value - 3 to 5 dry, 3 or 4 moist
Chroma - 2 to 4 moist or dry
Percent clay content - 32 to 50
Reaction - neutral to slightly alkaline

2Bkb horizon:
Value - 5 to 8 dry, 4 or 5 moist
Chroma - 2 to 4 moist or dry
Percent clay content - 30 to 40
Percent coarse fragments - 0 to 5
Reaction - slightly to moderately alkaline

MOONVILLE SERIES

TAXONOMIC CLASS

Medial, amorphic, frigid Typic Vitrixerands

SETTING

Depth class: very deep

Drainage class: well drained

Permeability: moderate

Positions on landscape: mountainsides

Parent material: - volcanic ash from the Craters of the Moon volcanics

Slope range: 15 to 60 percent

Elevation: 6,000 to 7,200 feet

Climatic data (average annual):
*precipitation - 12 to 18 inches
*air temperature - 38 to 45 degrees F
*frost-free period - 50 to 70 days

TYPICAL PEDON DESCRIPTION

A--0 to 7 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4) moist; weak coarse platy structure that parts to weak fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, fine and common medium roots; common very fine interstitial pores; neutral (pH 6.6); gradual wavy boundary.

Bw1--7 to 15 inches; strong brown (7.5YR 5/6) loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine, fine and medium roots; many very fine interstitial pores; neutral (pH 6.8); abrupt wavy boundary.

Bw2--15 to 31 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few fine and common medium roots; few fine tubular, and many very fine and fine interstitial pores; neutral (pH 7.0); clear wavy boundary.

Bw3--31 to 60 inches; light gray (10YR 7/2) loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; common fine and medium tubular pores; moderately alkaline (pH 8.2).

TYPICAL PEDON LOCATION

Butte County, Idaho; about 101/2 miles south of Arco, Idaho; 1,800 feet west and 2,950 feet south of the northeast corner of section. 22, T.2 N., R.26 E.; latitude - 43 degrees, 29 minutes, 02 seconds north; Longitude - 113 degrees, 20 minutes, 30 seconds west

RANGE IN CHARACTERISTICS

Andic soil properties:
Phosphate retention is 50 to 80 percent
Acid-oxalate aluminum plus one-half the iron is 1.0 to 2.0
Glass content - 5 to 30 percent
15-bar water - 12 to 15 percent dry , 20 to 30 percent moist

Profile:
Field estimated clay content - 12 to 26 percent
The soil profile contains 2 to 10 percent cinder gravels throughout

Average annual soil temperature - 37 to 44 degrees F

Particle size control section:
Clay - 7 to 27 percent
Cinders - 0 to 10 percent
Reaction - neutral to moderately alkaline

A horizons:
Hue - 10YR or 7.5YR

Value - 3 through 5 dry and 2 through 4 moist
Chroma - 3 or 4 dry and 2 through 4 moist

Bw horizons:
Hue - 10YR or 7.5YR
Value - 5 or 6 dry and 4 or 5 moist
Chroma - 4 through 6

Bk horizon:
Hue - 10YR or 7.5YR
Value - 6 or 7 dry and 5 or 6 moist
Chroma - 2 through 4

NORTHCRATER SERIES

TAXONOMIC CLASS

Ashy-skeletal, glassy, nonacid, frigid Vitrandic Xerorthents

SETTING

Depth class: very deep
Drainage class: well drained
Permeability: rapid

Positions on landscape: recent cinder cones and associated with nonvegetated cinder land

Parent material: wind deposited volcanic tephra

Slope range: 2 to 50 percent

Elevation: 5,400 to 6,500 feet

Climatic data (average annual):
*precipitation - 14 to 18 inches
*air temperature - 40 to 45 degrees F
*frost-free period - 60 to 90 days

TYPICAL PEDON DESCRIPTION

A1--0 to 4 inches; very dark grayish brown (10YR 3/2) very gravelly loamy sand, black (10YR 2/1) moist; weak fine granular structure; loose; common very fine and fine roots; many very fine interstitial pores; about 40 percent gravel size cinders; neutral (pH 7.3); clear smooth boundary.

A2--4 to 8 inches; very dark yellowish brown (10YR 3/2) very gravelly loamy sand, black (10YR 2/1) moist; single grained; loose; common very fine, fine roots; common very fine to medium interstitial pores; about 50 percent gravel size cinders; neutral (pH 7.3); clear smooth boundary.

C1--8 to 12 inches; very dark brown (10YR 2/2) extremely gravelly loamy sand, black (10YR 2/1) moist; single grained; loose; common very fine, and fine roots; common very fine tubular pores; about 65 percent gravel size cinders; slightly alkaline (pH 7.4); clear wavy boundary.

C2--12 to 20 inches; dark yellowish brown (10YR 4/4) very gravelly loamy sand, very dark brown (10YR 2/2) moist; single grained; loose; few very fine roots; common very fine to medium interstitial pores; about 45 percent gravel size cinders; slightly alkaline (pH 7.4); clear wavy boundary.

C3--20 to 30 inches; very dark grayish brown (10YR 3/2) very gravelly loamy sand, very dark brown (10YR 2/2) moist; single grained; loose; few very fine roots; common very fine to medium interstitial pores; about 50 percent gravel size cinders; slightly alkaline (pH 7.4); clear wavy boundary.

C4--30 to 60 inches; very dark brown (10YR 2/2) very gravelly loamy sand, black (10YR 2/1) moist; single grained; loose; common very fine to medium interstitial pores; about 55 percent gravel size cinders; slightly alkaline (pH 7.4).

TYPICAL PEDON LOCATION

Butte County, Idaho; about 1 miles southeast of Craters of the Moon National Monument Headquarters; 1,100 feet west and 1,700 feet north of the southeast corner of sec. 1, T. 1 N., R. 24 E.; latitude 43 degrees, 25 minutes, 53 seconds north; longitude 113 degrees, 32 minutes, 35 seconds west.

RANGE IN CHARACTERISTICS

Profile:
Mean annual soil temperature - 42 to 47 degrees F
Reaction - neutral to slightly alkaline throughout

Andic soil properties:
Phosphate retention - 10 to 15 percent
Acid oxalate aluminum plus one-half the iron - 0.1 to 0.4
15-bar water - less than 10 percent dry

A horizon:
Value - 2 or 3 dry
Chroma - 1 or 2 moist or dry
Rock fragments - 40 to 60 percent

C horizon:
Value - 2 through 4 dry, 2 or 3 moist
Chroma - 1 through 4 moist or dry

Rock fragments - 45 to 90 percent

ROUNDKNOLL SERIES

TAXONOMIC CLASS

Ashy-skeletal, glassy, frigid Typic Vitrixerands

SETTING

Depth class: very deep

Drainage class: well drained

Permeability: rapid

Positions on landscape: kipukas on recent lava flows

Parent material: wind deposited volcanic tephra

Slope range: 2 to 20 percent

Elevation: 5,400 to 5,800 feet

Climatic data (average annual):
*precipitation – 14 to 18 inches
*air temperature - 40 to 45 degrees F
*frost-free period - 60 to 90 days

TYPICAL PEDON DESCRIPTION

A1--0 to 3 inches; brown (10YR 5/3) gravelly loamy sand, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; about 15 percent gravel size cinders; slightly alkaline (pH 7.5); clear smooth boundary.

A2--3 to 10 inches; yellowish brown (10YR 5/4) gravelly loamy sand, dark yellowish brown (10YR 3/4) moist; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine roots; many very fine and fine interstitial pores; about 30 percent gravel size cinders; slightly alkaline (pH 7.7); clear smooth boundary.

Bw--10 to 15 inches; brown (10YR 5/3) extremely gravelly loamy sand, brown (10YR 4/3) moist; single grained; loose; common very fine and fine roots; many very fine and fine and few medium interstitial pores; about 60 percent gravel size cinders; slightly alkaline (pH 7.6); clear smooth boundary.

Bk1--15 to 20 inches; brown (10YR 5/3) very gravelly loamy sand, brown (10YR 4/3) moist; single grained; loose; few very fine roots; many very fine, fine and medium interstitial pores; about 50 percent gravel size cinders; carbonates are on the cinders and are violently effervescent; slightly alkaline (pH 7.7); clear smooth boundary.

Bk2--20 to 30 inches; pale brown (10YR 6/3) extremely gravelly loamy sand, brown (10YR 4/3) moist; single grained; loose; few very fine roots; many very fine, fine and medium interstitial pores; about 60 percent gravel size cinders; carbonates are on cinders and are violently effervescent; moderately alkaline (pH 7.9); clear smooth boundary.

Bk3--30 to 60 inches; pale brown (10YR 6/3) extremely gravelly sand, brown (10YR 4/3) moist; single grained; loose; many very fine, fine and medium interstitial pores; about 80 percent gravel size cinders; carbonates are on cinders and are violently effervescent; moderately alkaline (pH 7.9).

TYPICAL PEDON LOCATION

Butte County, Idaho; about 1 miles east of Craters of Moon National Monument Headquarters, approximately 900 feet east and 1,900 south of the northwest corner of sec. 27, T. 2 N., R. 25 E.; latitude - 43 degrees, 28 minutes, 35 seconds north; longitude - 113 degrees, 28 minutes, 20 seconds west

RANGE IN CHARACTERISTICS

Profile:
Average annual soil temperature - 43 to 46 degrees F
Depth to carbonates - 10 to 20 inches

Particle-size control section:
Clay content - 2 to 5 percent
Rock fragment content - 30 to 80 percent

Andic soil properties:
Glass content - 30 to 50 percent
Phosphate retention - 25 to 50 percent
Acid oxalate aluminum plus one-half the acid oxalate iron - 0.4 to 1.0
15-bar water - 12 to 15 percent dry and s 10 to 20 percent moist

Particle-size control section averages 50 to 70 percent cinders

A horizon:
Value - 4 or 5 dry
Chroma - 3 or 4 dry or moist
Rock fragments content - 15 to 35 percent

Bw horizon:
Value - 4 or 5 dry and 3 or 4 moist
Chroma - 3 or 4 dry
Texture – very gravelly loamy sand and extremely gravelly loamy sand
Rock fragment content - 50 to 60 percent

Bk horizon:
Value - 5 or 6 dry and 3 or 4 moist
Chroma - 2 through 4 dry
Texture - very gravelly loamy sand, extremely gravelly loamy sand, extremely gravelly sand
Rock fragment content - 50 to 80 percent

SILENTCONE SERIES

TAXONOMIC CLASS

Ashy-skeletal, glassy, frigid Humic Vitrixerands

SETTING

Depth class: deep

Drainage class: well drained

Permeability: moderate

Positions on landscape: recent basalt plains and associated lava flows

Parent material: wind-deposited volcanic tephra

Slope range: 2 to 15 percent

Elevation: 4,800 to 6,000 feet

Climatic data (average annual):
*precipitation - 14 to 18 inches
*air temperature - 40 to 45 degrees F
*frost-free period - 60 to 90 days

TYPICAL PEDON DESCRIPTION

A1--0 to 4 inches; dark grayish brown (10YR 4/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine interstitial pores; about 35 percent gravel-size cinders; neutral (pH 7.3); clear smooth boundary. (2 to 6 inches thick)

A2--4 to 10 inches; brown (10YR 4/3) very gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine medium and coarse roots; common very fine tubular pores; about 35 percent gravel-size cinders; slightly alkaline (pH 7.4); clear wavy boundary (4 to 9 inches thick)

Bw--10 to 24 inches; brown (10YR 5/3) very gravelly loam, dark yellowish brown (10YR 4/4) moist; single grained; loose; common very fine, fine medium and coarse roots; common very fine tubular pores; about 45 percent gravel-size cinders; slightly alkaline (pH 7.4); clear wavy boundary (4 to 15 inches thick).

2R1--24 to 48 inches; basalt with vertical fractures 0.5 to 2 cm wide (1 to 3 meters apart) and B material in fractures, few very fine, fine and medium roots in fractures.

2R2--48 inches; basalt with fractures more than 3 meters apart.

TYPICAL PEDON LOCATION

Butte County, Idaho; about 1 mile south of Craters of Moon National Monument Headquarters; 200 feet south and 1,400 feet west of the northeast corner of sec. 25, T. 2 N., R. 24 E.; latitude - 113 degrees, 32 minutes, 24 seconds north; longitude - 42 degrees, 28 minutes, 50 seconds west.

RANGE IN CHARACTERISTICS

Profile:
Depth to basalt bedrock - 20 to 30 inches
Mean annual soil temperature - 42 to 47 degrees F
Mollic epipedon - 7 to 12 inches thick

Andic soil properties:
Glass content - 30 to 50 percent
Phosphate retention - 25 to 50 percent
Acid oxalate aluminum plus one-half the acid oxalate iron is 0.4 to 1.0
15-bar water, dry is 5 to 12 and moist is 10 to 20 percent.

A horizon:
Value - 4 or 5 dry
Chroma - 2 or 3 moist or dry
Rock fragments - 35 to 50 percent cinders

Bw horizon:
Value - 4 or 5 dry, 3 or 4 moist
Chroma - 3 or 4 moist or dry
Rock fragments - 40 to 60 percent cinders

SUNSETCONE SERIES

TAXONOMIC CLASS

Medial over pumiceous or cindery, amorphic over glassy Xeric Vitricryands

SETTING

Depth class: very deep

Drainage class: well drained

Permeability: moderately rapid over very rapid

Positions on the landscape: north-facing slopes on cinder cones

Parent Material: wind deposited volcanic tephra and loess

Slope range: 30 to 60 percent

Elevation: 5,500 to 6,500 feet

Climatic data (average annual):
*precipitation - 16 to 20 inches
*air temperature - 37 to 45 degrees F
*frost-free period - 30 to 70 days

TYPICAL PEDON DESCRIPTION

Oi--2 to 1 inch; Undecomposed Douglas-fir needles and twigs.

Oe--1 inch to 0; slightly decomposed Douglas-fir needles and root mat.

A1--0 to 4 inches; brown (10YR 4/3) gravelly loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very

fine and fine and common medium and coarse roots; many very fine interstitial pores; about 20 percent gravel-size cinders; moderately alkaline (pH 7.9); clear smooth boundary.

A2--4 to 6 inches; dark grayish brown (10YR 4/2) gravelly loam, black (10YR 2/1) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; common very fine tubular pores; about 15 percent gravel-size cinders; moderately alkaline (pH 7.9); gradual wavy boundary.

AB--6 to 10 inches; 70 percent brown (10YR 5/3) and 30 percent grayish brown (10YR 5/2) very gravelly loam, black (10YR 2/1) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; common very fine tubular pores; about 35 percent gravel-size cinders; moderately alkaline (pH 7.9); gradual smooth boundary.

Bw--10 to 24 inches; brownish yellow (10YR 6/6) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; single grained; loose; many very fine and fine and common medium and coarse roots; common very fine tubular pores; about 35 percent gravel-size cinders; moderately alkaline (pH 8.0); abrupt wavy boundary.

2C1--24 to 30 inches; dark brown (10YR 3/3) cobbles, black (10YR 2/1) moist; single-grained; loose; many very fine and fine and common medium and coarse roots; common medium and coarse interstitial pores; 70 percent cobble-size cinders and 20 percent gravel-size cinders; gradual wavy boundary.

2C2--30 to 60 inches; dark brown (10YR 3/3) gravel, black (10YR 2/1) moist; single-grained; loose; many very fine, fine, and medium and few coarse interstitial pores; 85 percent gravel-size cinders and 10 percent cobble-size cinders.

TYPICAL PEDON LOCATION

Butte County, Idaho; about 1/2 mile north of Craters of Moon National Monument Headquarters; 1,900 feet north and 2,000 feet east of the southwest corner of sec. 26, T. 2 N., R. 24 E.; longitude - 113 degrees, 34 minutes, 00 seconds west; latitude - 43 degrees, 28 minutes, 19 seconds north.

RANGE IN CHARACTERISTICS

Profile:
Depth to cinders or 2C horizons - 14 to 40 inches
Mean annual soil temperature - 40 to 44 degrees F
Mean summer soil temperature is 45 to 47 degrees
Mollic epipedon - 7 to 15 inches thick
The upper part of the particle-size control section averages 20 to 35 percent cinders

Andic soil properties:
Glass content - 5 to 30 percent
Phosphate retention - 50 to 80 percent
Acid oxalate aluminum plus one-half the acid oxalate iron - 1.0 to 2.0
15-bar water - 12 to 15 percent dry and 20 to 30 percent moist

A and AB horizons:
Chroma - 1 through 3 moist or dry
Rock fragments - 15 to 35 percent cinders
Organic matter - 1 to 4 percent

Bw horizon:
Value - 5 or 6 dry, 2 through 4 moist
Textures – very gravelly sandy loam or very gravelly loam
Chroma - 1 through 6 moist or dry
Rock fragments - 35 to 45 percent cinders

TREEMOLD SERIES

TAXONOMIC CLASS

Ashy-skeletal, glassy, frigid Lithic Vitrixerands

SETTING

Depth class: very shallow

Drainage class: well drained

Permeability: moderate

Positions on landscape: recent basalt plains and associated recent lava flows

Parent material: wind deposited volcanic and cinders

Slope range: 2 to 15 percent

Elevation: 4,600 to 6,000 feet

Climatic data (average annual):
*precipitation - 14 to 18 inches
*air temperature - 40 to 45 degrees F
*frost-free period - 60 to 90 days

TYPICAL PEDON DESCRIPTION

A--0 to 2 inches; brown (10YR 4/3) very gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine tubular pores; 40 percent gravel size cinders; slightly acid (pH 6.2); clear smooth boundary.

Bw--2 to 9 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine tubular pores; 45 percent gravel size cinders; slightly acid (pH 6.4); gradual wavy boundary.

R--9 inches; basalt with vertical fractures 0.5 to 2.0 mm wide (1 to 3 meters apart) and B material in cracks.

TYPICAL PEDON LOCATION

Butte County, Idaho; about 1 mile south of the Craters of the Moon National Monument Headquarters; about 17 miles west of Arco, Id; 800 feet east and 1,100 feet north of the southwest corner of section. 23, T. 2 N., R. 24 E.; latitude - 43 degrees, 29 minutes, 03 seconds north; longitude - 113 degrees, 34 minutes, 17 seconds west

RANGE IN CHARACTERISTICS

Profile:
Average annual soil temperature - 42 to 47 degrees F
Depth to bedrock - 2 to 10 inches

Andic soil properties:
Phosphate retention - 25 to 50 percent.
Acid oxalate aluminum plus one-half the iron - 0.4-1.0
15-bar water - 5 to 12 percent dry and 10 to 20 percent moist
Glass content - 30 to 50 percent

A horizons:
Value - 4 or 5 dry
Chroma - 2 through 4 moist or dry
Bw horizons:
Hue - 10YR or 7.5YR
Value - 4 through 6 dry, 3 or 4 moist
Chroma - 4 through 6 dry or moist
Texture – very gravelly loamy or very gravelly sandy loam
Rock fragment content - 35 to 45 percent
Field estimate clay content - 10 to 26 percent

VITALE SERIES

TAXONOMIC CLASS

Loamy-skeletal, mixed, superactive, frigid Typic Argixerolls

SETTING

Depth class: moderately deep

Drainage class: well drained

Permeability: slow

Positions on landscape: foothills and mountainsides

Parent material: mantle of volcanic tephra over residuum and colluvium weathered from quartzitic sandstone and siltstone

Slope range: 30 to 60 percent

Elevation: 6,000 to 7,200 feet

Climatic data (average annual):
*precipitation - 14 to 18 inches
*air temperature - 38 to 42 degrees F
*frost-free period - 50 to 70 days

TYPICAL PEDON DESCRIPTION

A1-- 0 to 3 inches; grayish brown (10YR 5/2) very stony loam, brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine tubular pores; 25 percent gravel, 25 percent cobbles and 2 percent stones; neutral (pH 6.8); clear smooth boundary.

A2 -- 3 to 10 inches; brown (10YR 5/3) very cobbly loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine tubular pores; 20 percent gravel, 20 percent cobbles and 1 percent stones; neutral (pH 6.9); clear wavy boundary.

Bt1 -- 10 to 19 inches; brown (10YR 5/3) very cobbly clay loam, dark yellowish brown (10YR 3/4) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, fine and medium roots; many fine tubular pores; common faint clay films on faces of peds and in some pores; 15 percent gravel, 40 percent cobbles and 1 percent stones; neutral (pH 7.0); gradual wavy boundary.

Bt2 -- 19 to 24 inches; brown (7.5YR 5/2) very cobbly clay loam, dark brown (7.5YR 3/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine and medium roots; common fine tubular pores; common faint clay films on faces of peds and in some pores; 15 percent gravel, 40 percent cobbles and 1 percent stones; neutral (pH 7.2); gradual wavy boundary.

Bt3 -- 24 to 33 inches; light brown (7.5YR 6/4) very cobbly loam, dark brown (7.5YR 3/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine tubular pores; common faint clay films on faces of peds and in some pores: 15 percent gravel, 40 percent cobbles and 4 percent stones; neutral (pH 7.3); abrupt wavy boundary.
R -- 33 inches; quartzitic siltstone.

TYPICAL PEDON LOCATION

Butte County, Idaho; about two miles north of Craters of the Moon National Monument Headquarters; 100 feet east and 1700 feet south of the northwest corner of section 23, T.2 N., R.24 E.; latitude - 43 degrees, 29 minutes, 26 seconds north; longitude - 113 degrees, 34 minutes, 26 seconds west

RANGE IN CHARACTERISTICS

Profile:
Average annual soil temperature - 42 to 46 degrees F
Thickness of the mollic - 10 to 15 inches

Depth to bedrock - 20 to 40 inches
Reaction - neutral to slightly alkaline

Particle size control section:
Clay - 25 to 34 percent
Rock fragments - 35 to 60 percent

A horizons:
Value - 4 or 5 dry, 2 or 3 moist
Chroma 2 or 3 dry or moist

Bt horizons:
Hue 10YR or 7.5YR
Value - 5 or 6 dry
Chroma - 3 or 4 dry and moist
Texture - very gravelly clay loam, very gravelly loam or very cobbly loam

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low……0 to 3
Low……3 to 6
Moderate……6 to 9
High……9 to 12
Very high……more than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces

the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canyon. A long, deep, narrow, very steep sided valley with high, precipitous walls in an area of high local relief.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Cinders. A juvenile vitric vesicular pyroclastic fragment that falls to the earth in an essentially solid condition.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clayey soil. Silty clay, sandy clay, or clay.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse fragments. Mineral or rock particles larger than 2 millimeters and small than 10 inches in diameter.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane that typically takes the form of concentric layers visible to the naked eye.

Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cutbanks cave(in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized: excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Draw. A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus

Ecological site.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons

that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime(in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts(in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Extremely shallow soil. A soil that is 1 to 4 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fast intake(in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called normal field capacity, normal moisture capacity, or capillary capacity.

Fine textured soil. Sandy clay, silty clay, or clay.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent

flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Ground water. Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:

O horizon.--An organic layer of fresh and decaying plant residue.

A horizon.--The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.--The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.--The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.--The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.--Soft, consolidated bedrock beneath the soil.

R layer.--Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Iluviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration

capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2……very low
0.2 to 0.4…..……low
0.4 to 0.75……moderately low
0.75 to 1.25……..moderate
1.25 to 1.75……..moderately high
1.75 to 2.5……high
More than 2.5……..very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Kipuka. An area surrounded by a lava flow.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A surface marking the floor of an extinct lake, filled in by well sorted, stratified sediments.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Lithic contact. Less than 20 inches to bedrock.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition,

chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation; example, lava flows.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low…….less than 0.5 percent
Low…….0.5 to 1.0 percent
Moderately low...1.0 to 2.0 percent
Moderate…..……2.0 to 4.0 percent
High……4.0 to 8.0 percent
Very high……...more than 8.0 percent

Overstory. The trees in a forest that form the upper crown cover.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, hardpan, claypan, plowpan, and traffic pan.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square

meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." The historic terms describing permeability, are in inches per hour. Saturated hydraulic conductivity are in *u*m per second. These rating are as follows:

Permeability class	in/hr	*u*m/s
Impermeable	0.00 - 0.0015	0.00 - 0.01
Very slow	0.0015 - 0.06	0.01 - 0.42
Slow	0.06 - 0.2	0.42 - 1.4
Moderately slow	0.2 - 0.6	1.4 - 4
Moderate	0.6 - 2.0	4 - 14
Moderately rapid	2.0 - 6.0	14 - 42
Rapid	6.0 - 20	42 - 141
Very rapid	20 - 100	141 - 705

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter(in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential natural plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and

quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid……less than 3.5
Extremely acid……3.5 to 4.4
Very strongly acid……..4.5 to 5.0
Strongly acid……..……5.1 to 5.5
Moderately acid……..5.6 to 6.0
Slightly acid……..…..6.1 to 6.5
Neutral……..…..6.6 to 7.3
Slightly alkaline..……7.4 to 7.8
Moderately alkaline…....7.9 to 8.4
Strongly alkaline……..…8.5 to 9.0
Very strongly alkaline...9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regeneration. The new growth of a natural plant community, developing from seed.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly

weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline……0 to 4
Slightly saline……..……4 to 8
Moderately saline……8 to 16
Strongly saline……More than 16

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scree. A collective term for an accumulation of coarse rock debris or a sheet of coarse debris mantling a slope. Scree is not a synonym of talus, as scree includes loose, coarse fragment material on slopes without cliffs. Compare talus, colluvium, mass movement.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder slope. The uppermost inclined surface at the top of a hillside. It is the transition zone from the back slope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell(in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is silty or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level……0 to 1 percent
Very gently sloping…0 to 2 percent
Gently sloping……2 to 4 percent
Moderately sloping…4 to 12 percent
Strongly sloping……12 to 20 percent
Moderately steep……20 to 30 percent
Steep……..30 to 50 percent
Very steep……..50 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill(in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na to Ca+ Mg. The degrees of sodicity and their respective ratios are:

Slight..……less than 13:1
Moderate……13-30:1
Strong.……more than 30:1

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand…..2.0 to 1.0
Coarse sand……..…1.0 to 0.5
Medium sand…..…..0.5 to 0.25
Fine sand…..……0.25 to 0.10
Very fine sand…..…0.10 to 0.05
Silt……0.05 to 0.002
Clay……..……less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the materials below the solum. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grain (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus. Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace(geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Tread. The relatively flat terrace surface that was cut or built by stream or wave action.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Unstable fill(in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is 4 to 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Volcanic ash. Fine pyroclastic material under 2mm in diameter.

Volcanic tephra. A general term for all pyroclastics of a volcano.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Waterspreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Summary of Tables

TABLE 1. TEMPERATURE AND PRECIPITATION

WETS Station : CRATERS OF THE MOON NM, ID2260
Latitude: 4328 Longitude: 11334 Elevation: 05900
State FIPS/County(FIPS): 16023 County Name: Butte
Start yr. - 1961 End yr. - 1990

Month	Temperature (Degrees F.)			Precipitation (Inches)				
					30% chance will have		avg # of days w/.1 or more	avg total snow fall
	avg daily max	avg daily min	avg	avg	less than	more than		
January	28.5	9.5	19.0	2.27	1.04	2.77	4	22.5
February	33.4	13.4	23.4	1.48	0.76	1.87	4	15.8
March	40.7	19.6	30.2	1.36	0.78	1.66	4	11.5
April	53.0	27.9	40.4	1.07	0.45	1.31	3	4.4
May	64.3	36.3	50.3	1.72	0.98	2.10	4	2.3
June	73.9	44.3	59.1	1.30	0.58	1.59	3	0.0
July	84.0	51.6	67.8	0.78	0.26	0.94	2	0.0
August	82.1	50.1	66.1	0.91	0.37	1.18	2	0.0
September	70.8	40.2	55.5	0.93	0.40	1.26	2	0.6
October	58.8	30.9	44.8	0.79	0.35	1.03	2	1.5
November	40.4	20.7	30.5	1.43	0.90	1.81	5	11.2
December	29.6	10.6	20.1	2.05	0.89	2.49	5	20.4
Annual	-----	-----	-----	------	12.58	17.50	--	----
Average	55.0	29.6	42.3	------	------	------	--	----
Total	-----	-----	-----	16.10	------	------	40	90.2

Table 2. Freeze Days in Spring and Fall

(Recorded in the period 1961 to 1990 at Craters of the Moon National Monument station)

	Daily Minimum Temperature		
Probability	# days > 24F	# days > 28F	# days > 32F
9 years in 10	127	99	62
8 years in 10	136	106	71
5 years in 10	151	121	89
2 years in 10	167	136	107
1 year in 10	176	144	117

	Temperature		
Probability	24F or lower	28F or lower	32F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 17	June 13	July 3
2 years in 10 later than--	May 13	June 6	June 26
5 years in 10 later than--	May 6	May 23	June 13
First freezing temperature in fall:			
1 yr in 10 earlier than--	September 17	September 7	August 24
2 yrs in 10 earlier than--	September 23	September 13	August 30
5 yrs in 10 earlier than--	October 6	September 23	September 11

TABLE 3. GROWING SEASON

Probability	Temperature		
	24 F or higher	28 F or higher	32 F or higher
	Beginning and Ending Dates Growing Season Length		
50 percent *	5/ 5 to 10/ 4 151 days	5/23 to 9/22 121 days	6/13 to 9/10 89 days
70 percent *	4/30 to 10/ 9 161 days	5/19 to 9/26 131 days	6/ 7 to 9/16 101 days

* Percent chance of the growing season occurring between the Beginning and Ending dates.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

TABLE 4. ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol	Soil name	Acres	Percent
1	LAVA FLOWS	30943	57.7
2	LAVA FLOWS-CINDERHURST COMPLEX, 2 TO 15 PERCENT SLOPES	9455	17.7
3	LAVA FLOWS-CINDERHURST EXTREMELY SHALLOW COMPLEX, 2 TO 15 PERCENT SLOPES	6711	12.5
4	TREEMOLD-SILENTCONE-LAVA FLOWS COMPLEX, 2 TO 15 PERCENT SLOPES	343	.6
5	CINDER LAND-NORTHCRATER ASSOCIATION, 2 TO 50 PERCENT SLOPES	622	1.2
6	BIGCINDER SANDY LOAM, 20 TO 40 PERCENT SLOPES	2304	4.3
7	INFERNOCONE GRAVELLY SANDY LOAM, 2 TO 20 PERCENT SLOPES	66	.1
8	INFERNOCONE GRAVELLY SANDY LOAM, 20 TO 40 PERCENT SLOPES	161	.3
9	ECHOCRATER GRAVELLY LOAMY SAND, 20 TO 40 PERCENT SLOPES	477	.9
10	ROUNDKNOLL ASSOCIATION, 2 TO 20 PERCENT SLOPES	11	.1
11	HAL-MOONVILLE ASSOCIATION, 15 TO 60 PERCENT SLOPES	230	.4
12	SUNSETCONE GRAVELLY LOAM, 30 TO 60 PERCENT SLOPES	67	.1
13	SUNSETCONE-GRASSYCONE COMPLEX, 30 TO 50 PERCENT SLOPES	93	.2
14	GOODALFS-CRATERS ASSOCIATION, 0 TO 5 PERCENT SLOPES	53	.1
15	VITALE-BLACKSPAR COMPLEX, 30 TO 60 PERCENT SLOPES	194	.4
16	LAVACREEK-DOLLARHIDE COMPLEX, 15 TO 60 PERCENT SLOPES	194	.4
17	LAVACREEK-VITALE ASSOCIATION, 30 TO 60 PERCENT SLOPES	835	1.6
18	LAVACREEK-DOLLARHIDE-GRASSYCONE COMPLEX, 30 TO 60 PERCENT SLOPES	580	1.1
19	BANCROFT SILT LOAM, 1 TO 4 PERCENT SLOPES	132	.2
20	MCBIGGAM SILT LOAM, 2 TO 8 PERCENT SLOPES	57	.1
	Total	53528	100.0

TABLE 5. RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Ecological site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Percent
1:					
LAVA FLOWS	---	FAVORABLE	---		
		NORMAL	---		
		UNFAVORABLE	---		
2:					
LAVA FLOWS	---	FAVORABLE	---		
		NORMAL	---		
		UNFAVORABLE	---		
CINDERHURST	010AY020ID MIXED SHRUB 12-16” ARVA2/PONE	FAVORABLE	450	Nevada bluegrass	5
		NORMAL	300	antelope bitterbrush	5
		UNFAVORABLE	100	common chokecherry	5
				fernbush	5
				mountain big sagebrush	55
				other perennial forbs	5
				other perennial grasses	5
				parsnipflower buckwheat	5
				penstemon	5
				whortleleaf snowberry	5
3:					
LAVA FLOWS	---	FAVORABLE	---		
		NORMAL	---		
		UNFAVORABLE	---		
CINDERHURST	010AY020ID MIXED SHRUB 12-16” ARVA2/PONE	FAVORABLE	225	Nevada bluegrass	5
		NORMAL	150	antelope bitterbrush	5
		UNFAVORABLE	50	common chokecherry	5
				fernbush	5
				mountain big sagebrush	55
				other perennial forbs	5
				other perennial grasses	5
				parsnipflower buckwheat	5
				penstemon	5
				whortleleaf snowberry	5
4:					
TREEMOLD	*	FAVORABLE	400	Sandberg wheatgrass	20
		NORMAL	300	mountain big sagebrush	5
		UNFAVORABLE	200	scabland penstemon	5
				wyeth buckwheat	5
				blue eyed mary	5
				low sagebrush	50
				hood’s phlox	10
SILENTCONE	013XY006ID SANDY LOAM 16-22” ARVA2/PSSS6	FAVORABLE	1800	antelope bitterbrush	5
		NORMAL	1400	bluebunch wheatgrass	15
		UNFAVORABLE	1000	mountain big sagebrush	10
				whortleleaf snowberry	5
				Indian ricegrass	10
				tapertip hawksbeard	5
				arrowleaf balsamroot	10
				serviceberry	5
LAVA FLOWS	---	FAVORABLE	---		
		NORMAL	---		
		UNFAVORABLE	---		
5:					
CINDER LAND	---	FAVORABLE	---		
		NORMAL	---		
		UNFAVORABLE	---		
NORTHCRATER	*	FAVORABLE	250	Indian ricegrass	5
		NORMAL	150	bottlebrush squirreltail	5
		UNFAVORABLE	100	monkey flower	15
				dwarf onion	15

TABLE 5. RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Ecological site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		Percent
			Lb/acre		
				dwarf buckwheat	15
				bitterroot	10
				white forget-me-not	10
				waterleaf	5
				wyeth buckwheat	20
6:					
BIGCINDER -----	*	FAVORABLE	2500	Sandberg wheatgrass	10
		NORMAL	1800	mountain big sagebrush	10
		UNFAVORABLE	1000	basin wildrye	5
				wyeth buckwheat	5
				waterleaf	5
				wyeth biscuitroot	5
				sticky geranium	5
				hawkweed	5
				antelope bitterbrush	30
				green rabbitbrush	5
				limber pine	50
				serviceberry	5
				twinberry	5
				mountain snowberry	5
7:					
INFERNOCONE-----	010AY008ID N SLOPE LOAMY 16-20" ARVA2/FEID	FAVORABLE	1400	bluebunch wheatgrass	10
		NORMAL	1000	mountain big sagebrush	10
		UNFAVORABLE	800	Idaho fescue	30
				Nevada bluegrass	5
				prairie junegrass	5
				arrowleaf balsamroot	5
				antelope bitterbrush	5
				common snowberry	5
				tapertip hawksbeard	5
8:					
INFERNOCONE-----	010AY008ID N SLOPE LOAMY 16-20" ARVA2/FEID	FAVORABLE	1400	bluebunch wheatgrass	10
		NORMAL	1000	mountain big sagebrush	10
		UNFAVORABLE	800	Idaho fescue	30
				Nevada bluegrass	5
				prairie junegrass	5
				arrowleaf balsamroot	5
				antelope bitterbrush	5
				common snowberry	5
				tapertip hawksbeard	5
9:					
ECHOCRATER------	013XY006ID SANDY LOAM 16-22" ARVA2/PSSS6	FAVORABLE	1800	bluebunch wheatgrass	10
		NORMAL	1000	mountain big sagebrush	10
		UNFAVORABLE	1000	needle and thread grass	10
				antelope bitterbrush	10
				serviceberry	10
				phlox	10
				tapertip hawksbeard	5
				arrowleaf balsamroot	5
10:					
ROUNDKNOLL------	013XY006ID SANDY LOAM 16-22" ARVA2/PSSS6	FAVORABLE	1800	bluebunch wheatgrass	10
		NORMAL	1400	mountain big sagebrush	10
		UNFAVORABLE	1000	needle and thread grass	10
				antelope bitterbrush	10
				serviceberry	10
				phlox	10
				tapertip hawksbeard	5
				arrowleaf balsamroot	5
11:					
HAL----------	010AY008ID N SLOPE LOAMY 16-20" ARVA2/FEID	FAVORABLE	1400	Idaho fescue	30
		NORMAL	1000	antelope bitterbrush	5
		UNFAVORABLE	900	arrowleaf balsamroot	5
				bluebunch wheatgrass	10
				longleaf hawksbeard	5
				lupine	5
				mountain big sagebrush	10
				unknown	5

TABLE 5. RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Ecological site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Percent
				snowberry	5
MOONVILLE-------	10AY019ID LOAMY 12-16” ARVA2/PSSS6	FAVORABLE	1100	Achnatherum thurberianum	10
		NORMAL	900	Idaho fescue	5
		UNFAVORABLE	750	Sandberg bluegrass	5
				antelope bitterbrush	5
				balsamroot	5
				bluebunch wheatgrass	25
				lupine	5
				mountain big sagebrush	20
				other shrubs	5
12:					
SUNSETCONE------	DOUGLAS FIR/SNOWBERRY	FAVORABLE	---		
		NORMAL	---		
		UNFAVORABLE	---		
13:					
SUNSETCONE------	DOUGLAS FIR/SNOWBERRY	FAVORABLE	---		
		NORMAL	---		
		UNFAVORABLE	---		
GRASSYCONE------	010AY016ID 20”+ POTRT/CARU	FAVORABLE	800	Idaho fescue	5
		NORMAL	550	antelope bitterbrush	5
		UNFAVORABLE	350	bluebunch wheatgrass	5
				cinquefoil	5
				lomatium	5
				mountain big sagebrush	5
				mountain brome	10
				other perennial forbs	10
				other perennial grasses	10
				other shrubs	5
				pinegrass	25
				quaking aspen	10
14:					
GOODALFS-------	*	FAVORABLE	4000	basin wildrye	90
		NORMAL	3500	mustard	5
		UNFAVORABLE	2500	slender wire lettuce	5
				mountain big sagebrush	T
CRATERS --------	*	FAVORABLE	2500	basin wildrye	15
		NORMAL	1800	Idaho fescue	15
		UNFAVORABLE	1250	tapertip hawksbeard	5
				yarrow	5
				white stoneseed	5
				mountain big sagebrush	35
				antelope bitterbrush	5
				lupine	5
				Nevada bluegrass	5
				gray rabittbrush	5
15:					
VITALE----------	10AYOO9ID SOUTH SLP GRAVELLY 12-16” ARVA2/PSSS6	FAVORABLE	1100	Sandberg bluegrass	5
		NORMAL	800	antelope bitterbrush	5
		UNFAVORABLE	450	arrowleaf balsamroot	5
				basin wildrye	5
				bluebunch wheatgrass	30
				lupine	5
				mountain big sagebrush	25
				other perennial grasses	5

TABLE 5. RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Ecological site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Percent
				other shrubs	5
				whortleleaf snowberry	5
BLACKSPAR-------	10AY007ID SHALLOW STONY 8-16”	FAVORABLE	400	thurber needlegrass	5
	ARAR8/PSSS6	NORMAL	250	wildrye	5
		UNFAVORABLE	200	Sandberg bluegrass	20
				bluebunch wheatgrass	20
				low sagebrush	25
				other annual forbs	5
				other perennial forbs	5
				other perennial grasses	5
				other shrubs	5
				spiny phlox	5
16:					
LAVACREEK-------	012XY024ID SUBALPINE SLOPE LOAMY	FAVORABLE	1400	Idaho fescue	20
	20”+ ARTRVS/FEID	NORMAL	1200	arrowleaf balsamroot	5
		UNFAVORABLE	1000	bluebunch wheatgrass	15
				common chokecherry	5
				lupine	5
				subalpine big sagebrush	15
				other perennial forbs	5
				other perennial grasses	5
				other shrubs	5
				prairie junegrass	5
				whortleleaf snowberry	5
DOLLARHIDE------	012XY025ID SHALLOW SUBALPINE	FAVORABLE	650	Idaho fescue	30
	12-24” ARAR8/FEID	NORMAL	400	bluebunch wheatgrass	5
		UNFAVORABLE	175	hotsprings sagebrush	25
				low sagebrush	5
				mountain big sagebrush	5
				other perennial forbs	10
				other perennial grasses	15
				other shrubs	5
17:					
LAVACREEK-------	010AY008ID NORTH SLOPE LOAMY	FAVORABLE	1400	Idaho fescue	20
	16-20”+ ARVA2/FEID	NORMAL	1200	arrowleaf balsamroot	5
		UNFAVORABLE	1000	bluebunch wheatgrass	15
				common chokecherry	5
				lupine	5
				mountain big sagebrush	15
				other perennial forbs	5
				other perennial grasses	5
				other shrubs	5
				prairie junegrass	5
				whortleleaf snowberry	5
VITALE----------	10AYOO9ID SOUTH SLP GRAVELLY	FAVORABLE	1100	Sandberg bluegrass	5
	12-16” ARVA2/PSSS6	NORMAL	800	antelope bitterbrush	5
		UNFAVORABLE	450	arrowleaf balsamroot	5
				basin wildrye	5
				bluebunch wheatgrass	30
				lupine	5
				mountain big sagebrush	25
				other perennial grasses	5
				other shrubs	5
				whortleleaf snowberry	5
18:					
LAVACREEK-------	010AY008ID NORTH SLOPE LOAMY	FAVORABLE	1400	Idaho fescue	20
	16-20”+ ARVA2/FEID	NORMAL	1200	arrowleaf balsamroot	5
		UNFAVORABLE	1000	bluebunch wheatgrass	15
				common chokecherry	5
				lupine	5
				mountain big sagebrush	15
				other perennial forbs	5
				other perennial grasses	5
				other shrubs	5
				prairie junegrass	5

TABLE 5. RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Ecological site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		Percent
			Lb/acre		
				whortleleaf snowberry	5
DOLLARHIDE------	010AY011ID SHALLOW LOAMY 16-20”	FAVORABLE	750	Idaho fescue	5
	ARAR8/FEID	NORMAL	600	arrowleaf balsamroot	5
		UNFAVORABLE	400	bluebunch wheatgrass	5
				longleaf hawksbeard	30
				low sagebrush	5
				other perennial forbs	10
				other perennial grasses	10
				other shrubs	5
				prairie junegrass	20
GRASSYCONE------	010AY016ID 20”+ POTRT/CARU	FAVORABLE	800	Idaho fescue	5
		NORMAL	550	antelope bitterbrush	5
		UNFAVORABLE	350	bluebunch wheatgrass	5
				cinquefoil	5
				lomatium	5
				mountain big sagebrush	5
				mountain brome	10
				other perennial forbs	10
				other perennial grasses	10
				other shrubs	5
				pinegrass	25
				quaking aspen	10
19:					
BANCROFT--------	010AY023ID LOAMY 12-16”	FAVORABLE	1000	thurber needlegrass	10
	ARTR4/FEID	NORMAL	800	Idaho fescue	25
		UNFAVORABLE	550	antelope bitterbrush	5
				arrowleaf balsamroot	5
				bluebunch wheatgrass	10
				other perennial forbs	10
				other perennial grasses	5
				threetip sagebrush	25
				western wheatgrass	5
20:					
MCBIGGAM--------	010AY004 LOAMY 12-16”	FAVORABLE	1600	Idaho fescue	20
	ARVA2/FEID	NORMAL	1200	arrowleaf balsamroot	10
		UNFAVORABLE	900	bluebunch wheatgrass	15
				eriogonum	5
				lupine	5
				mountain big sagebrush	20
				prairie junegrass	5
				rabbitbrush	5

**** Entries that have an * do not have ecological site data available. These sites are very limited in size, extent and distribution and therefore ecological site information was not gathered and new ecological site descriptions were not written for these sites. Characteristic species and their composition and total annual production are listed in the section of the soil survey report titled “Detailed Soil Map Unit.”***

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TABLE 6. RECREATIONAL DEVELOPMENT

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and Trails
1: LAVA FLOWS	---	---	---	---
2: LAVA FLOWS	---	---	---	---
CINDERHURST	Severe: large stones small stones depth to rock	Severe: large stones small stones depth to rock	Severe: large stones slope small stones	Severe: large stones
3: LAVA FLOWS	---	---	---	---
CINDERHURST	Severe: large stones small stones depth to rock	Sever: large stones small stones depth to rock	Severe: large stones slope small stones	Severe: large stones
4: TREEMOLD	Severe: small stones depth to rock	Severe: small stones depth to rock	Severe: small stones depth to rock	Moderate: dusty
SILENTCONE	Severe: small stones	Severe: small stones	Severe: slope small stones	Moderate: dusty
LAVA FLOWS	---	---	---	---
5: CINDER LAND	---	--	---	---
NORTHCRATER	Severe: slope small stones	Severe: slope small stones	Severe: slope small stones	Severe: slope

TABLE 6. RECREATIONAL DEVELOPMENT, Continued

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and Trails
6: BIGCINDER	Severe: slope, small stones	Severe: slope, small stones	Severe: slope, small stones	Severe: slope
7: INFERNOCONE	Moderate: small stones	Moderate: small stones	Severe: slope, small stones	Moderate: too sandy
8: INFERNOCONE	Severe: slope	Severe: slope	Severe: slope, small stones	Severe: slope
9: ECHOCRATER	Severe: slope	Severe: slope	Severe: slope, small stones	Severe: slope
10: ROUNDKNOLL	Moderate: slope, small stones	Moderate: slope, small stones	Severe: Slope	Moderate: too sandy
11: HAL	Severe: slope, small stones	Severe: slope, small stones	Severe: slope, small stones	Severe: slope, small stones
MOONVILLE	Severe: slope	Severe: slope	Severe: slope	Severe: erodes easily, slope
12: SUNSETCONE	Severe: slope	Severe: slope	Severe: slope, small stones	Severe: slope
13: SUNSETCONE	Severe: slope, slope	Severe: slope, slope	Severe: slope, small stones	Severe: slope, slope

TABLE 6. RECREATIONAL DEVELOPMENT, Continued

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and Trails
GRASSYCONE	Severe: slope	Severe: slope	Severe: slope	Severe: erodes easily slope
14:				
GOODALFS	Severe: ponding	Severe: ponding	Severe: ponding	Severe: ponding
CRATERS	Moderate: too sandy	Moderate: too sandy	Severe: small stones	Moderate: too sandy
15:				
VITALE	Severe: slope small stones	Severe: slope small stones	Severe: slope small stones	Severe: slope small stones
BLACKSPAR	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope
16:				
LAVACREEK	Severe: slope small stones	Severe: slope small stones	Severe: slope small stones	Severe: slope
DOLLARHIDE	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones
17:				
LAVACREEK	Severe: slope small stones	Severe: slope small stones	Severe: slope small stones	Severe: slope
VITALE	Severe: slope	Severe: slope	Severe: slope small stones	Severe: slope
18:				
LAVACREEK	Severe: slope small stones	Severe: slope small stones	Severe: slope small stones	Severe: slope

TABLE 6. RECREATIONAL DEVELOPMENT, Continued

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and Trails
DOLLARHIDE----	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones
GRASSYCONE----	Severe: slope	Severe: slope	Severe: slope	Severe: erodes easily slope
19:				
BANCROFT------	Moderate: dusty	Moderate: dusty	Moderate: dusty slope	Moderate: dusty
20:				
MCBIGGAM------	Moderate: dusty	Moderate: dusty	Moderate: dusty slope small stones	Moderate: dusty

TABLE 7. WILDLIFE HABITAT
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1: LAVA FLOWS	---	---	---	---	---	---	---	---	---	---	---	---
2: LAVA FLOWS	---	---	---	---	---	---	---	---	---	---	---	---
CINDERHURST	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
3: LAVA FLOWS	---	---	---	---	---	---	---	---	---	---	---	---
CINDERHURST	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
4: TREEMOLD	Poor	Poor	Poor	---	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	Poor
SILENTCONE	Poor	Poor	Poor	---	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	Poor
LAVA FLOWS	---	---	---	---	---	---	---	---	---	---	---	---
5: CINDER LAND	---	---	---	---	---	---	---	---	---	---	---	---
NORTHCRATER	Poor	Poor	Good	---	Good	Good	Very poor	Very poor	Good	Good	Very poor	Good
6: BIGCINDER	Poor	Poor	Fair	---	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	Poor
7: INFERNOCONE	Poor	Poor	Poor	---	Very poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	Poor
8: INFERNOCONE	Poor	Poor	Poor	---	Very poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	Poor
9: ECHOCRATER	---	Poor	Poor	---	Very poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	Poor
10: ROUNDKNOLL	Fair	Good	Poor	---	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor	Poor

TABLE 7. WILDLIFE HABITAT, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
11:												
HAL	Very poor	Very poor	Fair	---	---	Fair	---	---	Poor	---	---	Fair
MOONVILLE	Fair	Good	Good	---	---	Good	Very poor	Very poor	Good	---	Very poor	Good
12:												
SUNSETCONE	Poor	Fair	Poor	---	Very poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	Poor
13:												
SUNSETCONE	Poor	Fair	Poor	---	Very poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	Poor
GRASSYCONE	Very poor	Very poor	Good	---	Good	Good	Very poor	Very poor	Poor	Good	Very poor	Good
14:												
GOODALFS	Fair	Good	Good	---	Good	Good	Fair	Fair	Good	Good	Fair	Good
CRATERS	Fair	Good	Fair	---	Fair	Fair	Poor	Poor	Fair	Poor	Poor	Poor
15:												
VITALE	Very poor	Very poor	Good	---	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
BLACKSPAR	Very poor	Very poor	Poor	---	---	Poor	Very poor	Very poor	Very poor	---	Very poor	Poor
16:												
LAVACREEK	Very poor	Very poor	Good	---	---	Good	Very poor	Very poor	Poor	---	Very poor	Good
DOLLARHIDE	Very poor	Poor	Poor	---	---	Poor	Very poor	Very poor	Poor	---	Very poor	Poor
17:												
LAVACREEK	Very poor	Very poor	Good	---	---	Good	Very poor	Very poor	Poor	---	Very poor	Good
VITALE	Very poor	Very poor	Good	---	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
18:												
LAVACREEK	Very poor	Very poor	Good	---	---	Good	Very poor	Very poor	Poor	---	Very poor	Good
DOLLARHIDE	Very poor	Poor	Poor	---	---	Poor	Very poor	Very poor	Poor	---	Very poor	Poor
GRASSYCONE	Very poor	Very poor	Good	---	Good	Good	Very poor	Very poor	Poor	Good	Very poor	Good
19:												
BANCROFT	Fair	Fair	Good	---	---	Good	Poor	Very poor	Fair	---	Very poor	Good
20:												
MCBIGGAM	Fair	Good	Good	---	---	Good	Poor	Very poor	Good	---	Very poor	Good

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TABLE 8. BUILDING SITE DEVELOPMENT

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
1: LAVA FLOWS	---	---	---	---	---
2: LAVA FLOWS	---	---	---	---	---
CINDERHURST	Severe: large stones depth to rock	Severe: large stones depth to rock	Severe: large stones depth to rock	Severe: large stones slope depth to rock	Severe: large stones depth to rock
3: LAVA FLOWS	---	---	---	---	---
CINDERHURST	Severe: large stones depth to rock	Severe: large stones depth to rock	Severe: large stones depth to rock	Severe: large stones slope depth to rock	Severe: large stones depth to rock
4: TREEMOLD	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
SILENTCONE	Severe: depth to rock	Moderate: depth to rock	Severe: depth to rock	Moderate: depth to rock	Moderate: depth to rock
LAVA FLOWS	---	---	---	---	---
5: CINDER LAND	---	---	---	---	---
NORTHCRATER	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope
6: BIGCINDER	Severe: slope cutbanks cave	Severe:	Severe:	Severe:	Severe:

TABLE 8. BUILDING SITE DEVELOPMENT--Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
7:					
INFERNOCONE--	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: frost action
8:					
INFERNOCONE--	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
9:					
ECHOCRATER---	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
10:					
ROUNDKNOLL---	Severe: cutbanks cave	Moderate: slope	Moderate: slope	Severe: slope	Moderate: frost action slope
11:					
HAL----------	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: frost action slope
MOONVILLE----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
12:					
SUNSETCONE---	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
13:					
SUNSETCONE---	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
GRASSYCONE---	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
14:					
GOODALFS-----	Severe: ponding	---	Severe: ponding	Severe: ponding	Severe: ponding
CRATERS------	Slight	Slight	Slight	Slight	Severe: frost action

TABLE 8. BUILDING SITE DEVELOPMENT--Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
15:					
VITALE	Severe: slope, depth to rock	Severe: slope	Severe: slope, depth to rock	Severe: slope	Severe: slope
BLACKSPAR	Severe: large stones, slope, depth to rock	Severe: large stones, slope, depth to rock	Severe: large stones, slope, depth to rock	Severe: large stones, slope, depth to rock	Severe: large stones, slope, depth to rock
16:					
LAVACREEK	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
DOLLARHIDE	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock
17:					
LAVACREEK	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
VITALE	Severe: slope, depth to rock	Severe: slope	Severe: slope, depth to rock	Severe: slope	Severe: slope
18:					
LAVACREEK	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
DOLLARHIDE	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock
GRASSYCONE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope

TABLE 8. BUILDING SITE DEVELOPMENT--Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
19:					
BANCROFT-----	Severe: cutbanks cave	Slight	Slight	Slight	Severe: frost action low strength
20:					
MCBIGGAM-----	Moderate: too clayey	Moderate: shrink-swell	Severe: shrink-swell	Moderate: shrink-swell slope	Severe: frost action low strength

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TABLE 9. CHEMICAL PROPERTIES OF THE SOILS
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1:								
LAVA FLOWS------	---	---	---	---	---	---	---	---
2:								
LAVA FLOWS------	---	---	---	---	---	---	---	---
CINDERHURST-----	0-3	15-20	15-25	6.1-7.3	0	0	0	0
	3-8	18-25	10-25	6.1-7.3	0	0	0	0
	8-18	---	---	---	---	---	---	---
3:								
LAVA FLOWS------	---	---	---	---	---	---	---	---
CINDERHURST-----	0-4	15-20	15-25	6.1-7.3	0	0	0	0
	4-14	---	---	---	---	---	---	---
4:								
TREEMOLD--------	0-2	6-12	15-25	6.1-6.5	0	0	0	0
	2-9	6-12	15-25	6.2-6.5	0	0	0	0
	9-19	---	15-25	---	---	---	---	---

TABLE 9. CHEMICAL PROPERTIES OF THE SOILS, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
SILENTCONE------	0-4	6-12	25-40	6.6-7.3	0	0	0	0
	4-10	4-10	25-40	6.6-7.3	0	0	0	0
	10-24	4-10	10-25	7.4-7.8	0	0	0	0
	24-48	---	---	---	---	---	---	---
	48-58	---	---	---	---	---	---	---
LAVA FLOWS------	---	---	---	---	---	---	---	---
5:								
CINDER LAND-----	---	---	---	---	---	---	---	---
NORTHCRATER-----	0-4	2-6	10-15	6.6-7.3	0	0	0	0
	4-8	2-6	10-15	6.6-7.3	0	0	0	0
	8-12	2-6	5.0-10	7.4-7.8	0	0	0	0
	12-20	2-6	5.0-10	7.4-7.8	0	0	0	0
	20-30	0-6	5.0-10	7.4-7.8	0	0	0	0
	30-60	0-6	5.0-10	7.4-7.8	0	0	0	0
6:								
BIGCINDER-------	0-2	2-6	15-25	6.6-7.3	0	0	0	0
	2-6	2-6	15-25	6.6-7.3	0	0	0	0
	6-10	0-4	15-25	6.6-7.3	0	0	0	0
	10-20	0-0	0.0-2.0	6.6-7.3	0	0	0	0
	20-24	2-6	0.0-5.0	6.6-7.3	0	0	0	0
	24-30	0-4	0.0-5.0	6.6-7.3	0	0	0	0
	30-60	0-0	0.0-0.0	6.6-7.3	0	0	0	0

TABLE 9. CHEMICAL PROPERTIES OF THE SOILS, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
7:								
INFERNOCONE-----	0-5	2-6	25-35	7.4-7.8	0	0	0	0
	5-10	2-6	25-35	7.4-7.8	0	0	0	0
	10-25	1-4	20-30	7.4-7.8	0	0	0	0
	25-35	1-4	20-30	7.4-7.8	0	0	0	0
	35-60	0-0	0.0-2.0	7.4-7.8	0	0	0	0
8:								
INFERNOCONE-----	0-5	2-6	25-35	7.4-7.8	0	0	0	0
	5-10	2-6	25-35	7.4-7.8	0	0	0	0
	10-25	1-4	20-30	7.4-7.8	0	0	0	0
	25-35	1-4	20-30	7.4-7.8	0	0	0	0
	35-60	0-0	0.0-2.0	7.4-7.8	0	0	0	0
9:								
ECHOCRATER------	0-3	1-4	25-35	7.4-7.8	0	0	0	0
	3-8	1-4	25-35	7.4-7.8	0	0	0	0
	8-15	1-4	20-30	7.4-7.8	0	0	0	0
	15-25	1-4	20-30	7.4-7.8	0	0	0	0
	25-60	0-0	0.0-5.0	---	0	0	0	0
10:								
ROUNDKNOLL------	0-3	1-4	15-20	7.4-7.8	0	0	0	0
	3-10	1-4	15-20	7.4-7.8	0	0	0	0
	10-15	1-4	15-20	7.4-7.8	0	0	0	0
	15-20	1-4	10-15	7.4-7.8	5-15	0	0	0
	20-30	1-4	10-15	7.9-8.4	5-15	0	0.0-2.0	0
	30-60	0-2	0.0-5.0	7.9-8.4	5-15	0	0.0-2.0	0

TABLE 9. CHEMICAL PROPERTIES OF THE SOILS, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
11:								
HAL	0-6	7-15	25-40	6.1-7.3	0	0	0	0
	6-12	7-15	25-40	6.1-7.3	0	0	0	0
	12-24	7-15	25-35	6.6-7.3	0	0	0	0
	24-40	7-15	10-25	6.6-7.3	0	0	0	0
	40-60	2-10	10-25	6.6-7.3	0	0	0	0
MOONVILLE	0-7	7-15	25-40	6.6-7.3	0	0	0	0
	7-15	7-15	30-40	6.6-7.3	0	0	0	0
	15-31	7-15	30-40	6.6-7.3	0	0	0	0
	31-60	7-15	10-25	7.9-8.4	0	0	0.0-2.0	0
12:								
SUNSETCONE	0-4	8-15	25-40	7.9-8.4	0	0	0.0-2.0	0
	4-6	8-12	25-40	7.9-8.4	0	0	0.0-2.0	0
	6-10	8-12	15-30	7.9-8.4	0	0	0.0-2.0	0
	10-24	4-6	15-30	7.9-8.4	0	0	0.0-2.0	0
	24-30	0-0	0.0-5.0	7.9-8.4	0	0	0.0-2.0	0
	30-60	0-0	0.0-5.0	7.9-8.4	0	0	0.0-2.0	0
13:								
SUNSETCONE	0-4	8-15	25-40	7.9-8.4	0	0	0.0-2.0	0
	4-6	8-12	25-40	7.9-8.4	0	0	0.0-2.0	0
	6-10	8-12	15-30	7.9-8.4	0	0	0.0-2.0	0
	10-24	4-6	15-30	7.9-8.4	0	0	0.0-2.0	0
	24-30	0-0	0.0-5.0	7.9-8.4	0	0	0.0-2.0	0
	30-60	0-0	0.0-5.0	7.9-8.4	0	0	0.0-2.0	0

TABLE 9. CHEMICAL PROPERTIES OF THE SOILS, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
GRASSYCONE------	0-2	2-6	5.0-15	5.6-7.3	0	0	0	0
	2-8	4-6	5.0-15	5.6-7.3	0	0	0	0
	8-56	6-10	5.0-10	5.6-7.3	0	0	0	0
	56-65	24-30	5.0-15	6.6-7.3	0	0	0	0
14:								
GOODALFS--------	0-3	6-16	10-20	6.6-7.3	0	0	0	0
	3-10	8-18	10-20	6.6-7.3	0	0	0	0
	10-24	18-24	15-30	6.6-7.3	0	0	0	0
	24-40	26-32	20-40	7.4-7.8	0	0	0	0
	40-60	20-26	15-20	7.4-7.8	0	0	0	0
CRATERS---------	0-4	2-6	15-25	6.6-7.3	0	0	0	0
	4-10	4-8	15-25	6.6-7.3	0	0	0	0
	10-22	6-10	15-25	6.6-7.3	0	0	0	0
	22-38	8-14	15-25	7.4-7.8	0	0	0	0
	38-60	10-12	10-15	7.4-7.8	0	0	0	0
15:								
VITALE----------	0-3	12-25	8.0-20	6.1-7.3	0	0	0	0
	3-10	24-26	8.0-20	6.6-7.8	0	0	0	0
	10-19	25-35	10-25	6.6-7.8	0	0	0	0
	19-24	25-35	10-25	6.6-7.8	0	0	0	0
	24-33	18-25	6.0-15	6.6-7.8	0	0	0	0
	33-43	---	---	---	---	---	---	---

TABLE 9. CHEMICAL PROPERTIES OF THE SOILS, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
BLACKSPAR-------	0-2	10-20	12-15	6.6-7.3	0	0	0	0
	2-6	10-20	12-15	6.6-7.3	0	0	0	0
	6-12	20-30	15-20	6.6-7.3	0	0	0	0
	12-22	---	---	---	---	---	---	---
16:								
LAVACREEK-------	0-10	7-15	20-40	6.1-7.3	0	0	0	0
	10-19	7-15	20-30	6.1-7.3	0	0	0	0
	19-36	7-15	20-30	6.1-7.3	0	0	0	0
	36-42	6-10	15-25	5.6-7.3	0	0	0	0
	42-59	6-10	15-25	5.6-7.3	0	0	0	0
	59-69	---	---	---	---	---	---	---
DOLLARHIDE------	0-8	8-18	10-20	6.6-7.8	0	0	0	0
	8-13	8-18	5.0-15	6.6-7.8	0	0	0	0
	13-16	---	---	---	---	---	---	---
	16-26	---	---	---	---	---	---	---
17:								
LAVACREEK-------	0-10	7-15	20-40	6.1-7.3	0	0	0	0
	10-19	7-15	20-30	6.1-7.3	0	0	0	0
	19-36	7-15	20-30	6.1-7.3	0	0	0	0
	36-42	6-10	15-25	5.6-7.3	0	0	0	0
	42-59	6-10	15-25	5.6-7.3	0	0	0	0
	59-69	---	---	---	---	---	---	---

TABLE 9. CHEMICAL PROPERTIES OF THE SOILS, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
VITALE----------	0-3	12-25	8.0-20	6.1-7.3	0	0	0	0
	3-10	24-30	8.0-20	6.6-7.8	0	0	0	0
	10-19	25-35	10-25	6.6-7.8	0	0	0	0
	19-24	25-35	10-25	6.6-7.6	0	0	0	0
	24-33	18-25	6.0-15	6.6-7.8	0	0	0	0
	33-43	---	---	---	---	---	---	---
18:								
LAVACREEK-------	0-10	7-15	20-40	6.1-7.3	0	0	0	0
	10-19	7-15	20-30	6.1-7.3	0	0	0	0
	19-36	7-15	20-30	6.1-7.3	0	0	0	0
	36-42	6-10	15-25	5.6-7.3	0	0	0	0
	42-59	6-10	15-25	5.6-7.3	0	0	0	0
	59-69	---	---	---	---	---	---	---
DOLLARHIDE------	0-8	8-18	10-20	6.6-7.8	0	0	0	0
	8-13	8-18	5.0-15	6.6-7.8	0	0	0	0
	13-16	---	---	---	---	---	---	---
	16-26	---	---	---	---	---	---	---
GRASSYCONE------	0-2	2-6	5.0-15	5.6-7.3	0	0	0	0
	2-8	4-6	5.0-15	5.6-7.3	0	0	0	0
	8-56	6-10	5.0-10	5.6-7.3	0	0	0	0
	56-65	24-30	5.0-15	6.6-7.3	0	0	0	0

TABLE 9. CHEMICAL PROPERTIES OF THE SOILS, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
19:								
BANCROFT--------	0-6	15-20	15-20	6.1-7.3	0	0	0	0
	6-12	15-20	15-20	6.1-7.3	0	0	0	0
	12-15	18-32	10-30	6.1-7.8	0-15	0	0	0
	15-26	18-32	10-30	6.1-7.8	0-15	0	0	0
	26-48	18-32	10-30	7.4-9.0	15-30	0	0.0-0.2	0
	48-60	18-32	10-30	7.4-9.0	15-30	0	0.0-0.2	0
20:								
MCBIGGAM--------	0-3	10-15	8.0-16	6.1-7.3	0	0	0	0
	3-10	10-15	8.0-16	6.1-7.3	0	0	0	0
	10-15	22-32	15-25	6.6-7.3	0	0	0	0
	15-26	22-32	15-25	6.6-7.3	0	0	0	0
	26-36	40-50	25-40	6.6-7.8	0-5	0	0	0
	36-46	40-50	25-40	6.6-7.8	0-5	0	0	0
	46-80	30-40	15-35	7.4-8.4	0-5	0	0.0-2.0	0

TABLE 10. PHYSICAL PROPERTIES OF THE SOILS

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer)

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Depth	Clay	Moist bulk density	Ksat	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	um/sec	In/in	Pct	Pct					
1:												
LAVA FLOWS------	---	---	---	---	---	---	---	---	---	-	---	---
2:												
LAVA FLOWS------	---	---	---	---	---	---	---	---	---	-	---	---
CINDERHURST-----	0-3	15-20	0.80-0.90	4.00-14.00	0.06-0.09	0.0-2.9	2.0-4.0	.15	.37	1	8	0
	3-8	18-25	0.80-0.90	4.00-14.00	0.06-0.12	0.0-2.9	1.0-2.0	.24	.37			
	8-18	---	---	---	---	---	---	---	---			
3:												
LAVA FLOWS------	---	---	---	---	---	---	---	---	---	-	---	---
CINDERHURST-----	0-4	15-20	0.80-0.90	4.00-14.00	0.06-0.09	0.0-2.9	2.0-4.0	.15	.37	1	8	0
	4-14	---	---	---	---	---	---	---	---			
4:												
TREEMOLD--------	0-2	6-12	0.80-0.90	4.00-14.00	0.10-0.12	0.0-3.0	2.0-4.0	.10	.24	1	7	38
	2-9	6-12	0.80-0.90	4.00-14.00	0.09-0.10	0.0-3.0	1.0-2.0	.10	.24			
	9-19	---	---	---	---	---	---	---	---			
SILENTCONE------	0-4	6-12	0.80-0.90	4.00-14.00	0.10-0.12	0.0-3.0	2.0-4.0	.10	.24	1	7	38
	4-10	4-10	0.80-0.90	4.00-14.00	0.10-0.12	0.0-3.0	2.0-4.0	.10	.24			
	10-24	4-10	0.80-0.90	4.00-14.00	0.09-0.10	0.0-3.0	1.0-2.0	.10	.24			
	24-48	---	---	---	---	---	---	---	---			
LAVA FLOWS------	---	---	---	---	---	---	---	---	---	-	---	---
5:												
CINDER LAND-----	---	---	---	---	---	---	---	---	---	-	---	---
NORTHCRATER-----	0-4	2-6	0.80-0.90	42.00-141.0	0.04-0.05	0.0-3.0	2.0-4.0	.10	.24	5	4	86
	4-8	2-6	0.80-0.90	42.00-141.0	0.03-0.04	0.0-3.0	2.0-4.0	.10	.24			
	8-12	2-6	1.15-1.25	42.00-141.0	0.02-0.03	0.0-3.0	1.0-2.0	.05	.24			
	12-20	2-6	1.15-1.25	42.00-141.0	0.03-0.04	0.0-3.0	1.0-2.0	.10	.24			
	20-30	0-6	1.15-1.25	42.00-141.0	0.03-0.04	0.0-3.0	0.5-1.0	.10	.24			
	30-60	0-6	1.15-1.25	42.00-141.0	0.03-0.04	0.0-3.0	0.5-1.0	.10	.24			
6:												
BIGCINDER-------	0-2	2-6	0.70-0.80	42.00-141.0	0.11-0.13	0.0-3.0	2.0-4.0	.24	.24	1	3	86
	2-6	2-6	0.70-0.80	42.00-141.0	0.07-0.08	0.0-3.0	2.0-4.0	.10	.24			
	6-10	0-4	0.80-0.90	42.00-141.0	0.06-0.08	0.0-3.0	1.0-2.0	.10	.24			
	10-20	0-0	1.15-1.25	42.00-141.0	0.00-0.02	0.0-0.0	0.0-0.1	.02	.02			
	20-24	2-6	1.15-1.25	42.00-141.0	0.03-0.04	0.0-3.0	0.5-1.0	.10	.24			
	24-30	0-4	1.15-1.25	42.00-141.0	0.03-0.04	0.0-3.0	0.5-1.0	.10	.24			
	30-60	0-0	1.15-1.25	42.00-141.0	0.00-0.02	0.0-0.0	0.0-0.1	.02	.02			
7:												
INFERNOCONE-----	0-5	2-6	0.70-0.80	14.00-42.00	0.09-0.10	0.0-3.0	2.0-4.0	.15	.28	3	4	86
	5-10	2-6	0.80-0.90	14.00-42.00	0.09-0.10	0.0-3.0	2.0-4.0	.15	.28			
	10-25	1-4	0.80-0.90	14.00-42.00	0.09-0.10	0.0-3.0	1.0-2.0	.15	.28			
	25-35	1-4	1.15-1.25	14.00-42.00	0.04-0.05	0.0-3.0	0.5-1.0	.15	.28			
	35-60	0-0	1.15-1.25	42.00-141.0	0.02-0.03	0.0-3.0	0.0-0.1	.02	.02			

TABLE 10. PHYSICAL PROPERTIES OF SOILS, Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer)

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Depth	Clay	Moist bulk density	Ksat	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	um/sec	In/in	Pct	Pct					
INFERNOCONE-----	0-5	2-6	0.70-0.80	14.00-42.00	0.09-0.10	0.0-3.0	2.0-4.0	.15	.28	3	4	86
	5-10	2-6	0.80-0.90	14.00-42.00	0.09-0.10	0.0-3.0	2.0-4.0	.15	.28			
	10-25	1-4	0.80-0.90	14.00-42.00	0.09-0.10	0.0-3.0	1.0-2.0	.15	.28			
	25-35	1-4	1.15-1.25	14.00-42.00	0.04-0.05	0.0-3.0	0.5-1.0	.15	.28			
	35-60	0-0	1.15-1.25	42.00-141.0	0.02-0.03	0.0-3.0	0.0-0.1	.02	.02			
9:												
ECHOCRATER------	0-3	1-4	0.80-0.90	42.00-141.0	0.05-0.06	0.0-3.0	2.0-4.0	.10	.24	3	3	86
	3-8	1-4	0.80-0.90	42.00-141.0	0.04-0.05	0.0-3.0	2.0-4.0	.10	.24			
	8-15	1-4	0.80-0.90	42.00-141.0	0.04-0.05	0.0-3.0	1.0-2.0	.10	.24			
	15-25	1-4	1.00-1.25	42.00-141.0	0.02-0.03	0.0-3.0	0.5-1.0	.05	.24			
	25-60	0-0	1.15-1.25	42.00-141.0	0.01-0.02	0.0-0.0	0.0-0.1	.02	.02			
10:												
ROUNDKNOLL------	0-3	1-4	0.80-0.90	42.00-141.0	0.05-0.07	0.0-3.0	2.0-4.0	.10	.24	5	3	86
	3-10	1-4	0.80-0.90	42.00-141.0	0.04-0.06	0.0-3.0	2.0-4.0	.10	.24			
	10-15	1-4	0.80-0.90	42.00-141.0	0.02-0.03	0.0-3.0	1.0-3.0	.10	.24			
	15-20	1-4	1.00-1.25	42.00-141.0	0.03-0.04	0.0-3.0	1.0-3.0	.05	.24			
	20-30	1-4	1.15-1.25	42.00-141.0	0.02-0.03	0.0-3.0	0.5-1.0	.05	.24			
	30-60	0-2	1.15-1.25	42.00-141.0	0.01-0.02	0.0-3.0	0.5-1.0	.05	.24			
11:												
HAL----------	0-6	7-15	0.70-0.80	4.00-14.00	0.12-0.16	0.0-2.9	1.0-2.0	.24	.43	4	6	48
	6-12	7-15	0.70-0.80	4.00-14.00	0.12-0.16	0.0-2.9	0.0-0.5	.32	.49			
	12-24	7-15	0.80-0.90	4.00-14.00	0.12-0.16	0.0-2.9	0.0-0.5	.32	.49			
	24-40	7-15	0.90-1.00	4.00-14.00	0.12-0.16	0.0-2.9	0.0-0.5	.32	.49			
	40-60	2-10	0.90-1.00	42.00-141.0	0.01-0.04	0.0-2.9	0.0-0.5	.05	.24			
MOONVILLE-------	0-7	7-15	0.80-0.90	4.00-14.00	0.19-0.21	0.0-2.9	4.0-15	.43	.43	5		
	7-15	7-15	0.80-0.90	4.00-14.00	0.19-0.21	0.0-2.9	2.0-3.0	.43	.43			
	15-31	7-15	0.80-0.90	4.00-14.00	0.19-0.21	0.0-2.9	2.0-3.0	.43	.43			
	31-60	7-15	0.80-0.90	4.00-14.00	0.19-0.21	0.0-2.9	0.5-1.0	.43	.43			
12:												
SUNSETCONE------	0-4	8-15	0.70-0.80	14.00-42.00	0.05-0.06	0.0-3.0	2.0-4.0	.17	.24	3	3	86
	4-6	8-12	0.70-0.80	14.00-42.00	0.05-0.07	0.0-3.0	1.0-2.0	.17	.24			
	6-10	8-12	0.80-0.90	14.00-42.00	0.04-0.05	0.0-3.0	1.0-2.0	.17	.24			
	10-24	4-6	0.80-0.90	14.00-42.00	0.04-0.05	0.0-3.0	0.5-1.0	.15	.20			
	24-30	0-0	1.15-1.25	14.00-42.00	0.00-0.02	0.0-0.0	0.0-0.1	.02	.02			
	30-60	0-0	1.15-1.25	41.00-141.0	0.00-0.02	0.0-0.0	0.0-0.1	.02	.02			
13:												
SUNSETCONE------	0-4	8-15	0.70-0.80	14.00-42.00	0.05-0.06	0.0-3.0	2.0-4.0	.17	.24	3	3	86
	4-6	8-12	0.70-0.80	14.00-42.00	0.05-0.07	0.0-3.0	1.0-2.0	.17	.24			
	6-10	8-12	0.80-0.90	14.00-42.00	0.04-0.05	0.0-3.0	1.0-2.0	.17	.24			
	10-24	4-6	0.80-0.90	14.00-42.00	0.04-0.05	0.0-3.0	0.5-1.0	.15	.20			
	24-30	0-0	1.15-1.25	14.00-42.00	0.00-0.02	0.0-0.0	0.0-0.1	.02	.02			
	30-60	0-0	1.15-1.25	41.00-141.0	0.00-0.02	0.0-0.0	0.0-0.1	.02	.02			
GRASSYCONE------	0-2	2-6	0.65-0.85	42.00-141.0	0.20-0.25	0.0-2.9	2.0-6.0	.64	.64	5	3	86
	2-8	4-6	0.65-0.85	42.00-141.0	0.20-0.25	0.0-2.9	1.0-4.0	.64	.64			
	8-56	6-10	0.65-0.85	42.00-141.0	0.20-0.25	0.0-2.9	0.2-2.0	.64	.64			
	56-65	24-30	1.05-1.20	4.00-14.00	0.10-0.12	0.0-2.9	0.0-0.5	.32	.64			

TABLE 10. PHYSICAL PROPERTIES OF SOILS, Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer)

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Depth	Clay	Moist bulk density	Ksat	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	um/sec	In/in	Pct	Pct					
14:												
GOODALFS	0-3	6-16	0.70-0.80	4.00-14.00	0.09-0.21	3.0-6.0	2.0-4.0	.43	.43	5	5	56
	3-10	8-18	0.80-0.90	4.00-14.00	0.19-0.21	3.0-6.0	2.0-4.0	.43	.43			
	10-24	18-24	1.15-1.30	4.00-14.00	0.19-0.21	3.0-6.0	1.0-3.0	.37	.37			
	24-40	26-32	1.30-1.40	0.60-4.00	0.19-0.21	6.0-9.0	0.5-2.0	.37	.37			
	40-60	20-26	1.25-1.35	4.00-14.00	0.19-0.21	3.0-6.0	0.5-1.0	.37	.37			
CRATERS	0-4	2-6	0.70-0.80	4.00-14.00	0.04-0.05	0.0-3.0	2.0-4.0	.15	.28	5	5	56
	4-10	4-8	0.70-0.80	4.00-14.00	0.04-0.05	0.0-3.0	1.0-3.0	.15	.28			
	10-22	6-10	0.80-0.90	4.00-14.00	0.03-0.04	0.0-3.0	1.0-3.0	.15	.28			
	22-38	8-14	1.15-1.25	4.00-14.00	0.04-0.06	0.0-3.0	0.5-1.0	.17	.28			
	38-60	10-12	1.20-1.25	4.00-14.00	0.05-0.06	0.0-3.0	0.5-1.0	.17	.28			
15:												
VITALE	0-3	12-25	1.30-1.45	4.00-14.00	0.09-0.12	0.0-2.9	1.0-3.0	.20	.28	2	8	0
	3-10	24-26	1.40-1.50	4.00-14.00	0.05-0.07	3.0-5.9	1.0-3.0	.10	.37			
	10-19	25-35	1.40-1.50	0.42-1.40	0.05-0.07	3.0-5.9	1.0-3.0	.10	.37			
	19-24	25-35	1.40-1.50	0.42-1.40	0.05-0.07	3.0-5.9	1.0-3.0	.10	.37			
	24-33	18-25	1.40-1.55	4.00-14.00	0.05-0.07	0.0-2.9	0.0-1.0	.17	.37			
	33-43	---	---	---	---	---	---	---	---			
BLACKSPAR	0-2	10-20	1.35-1.55	4.00-14.00	0.05-0.07	0.0-2.9	1.0-2.0	.24	.37	1	8	0
	2-6	10-20	1.35-1.55	4.00-14.00	0.05-0.07	0.0-2.9	1.0-2.0	.24	.37			
	6-12	20-30	1.40-1.60	4.00-14.00	0.04-0.06	0.0-2.9	0.5-1.0	.20	.43			
	12-22	---	---	---	---	---	---	---	---			
16:												
LAVACREEK	0-10	7-15	0.70-0.80	4.00-14.00	0.09-0.12	0.0-2.9	1.0-3.0	.28	.32	3	8	0
	10-19	7-15	0.80-0.90	4.00-14.00	0.08-0.11	0.0-2.9	1.0-2.0	.24	.43			
	19-36	7-15	1.00-1.20	4.00-14.00	0.08-0.11	0.0-2.9	1.0-2.0	.24	.43			
	36-42	6-10	1.20-1.30	14.00-42.00	0.05-0.08	0.0-2.9	0.5-1.0	.24	.43			
	42-59	6-10	1.20-1.30	14.00-42.00	0.05-0.08	0.0-2.9	0.5-1.0	.24	.43			
	59-69	---	---	---	---	---	---	---	---			
DOLLARHIDE	0-8	8-18	0.85-0.95	14.00-42.00	0.08-0.13	0.0-2.9	1.0-3.0	.20	.37	1	8	0
	8-13	8-18	1.35-1.50	14.00-42.00	0.05-0.09	0.0-2.9	0.5-1.0	.10	.32			
	13-16	---	---	---	---	---	---	---	---			
	16-26	---	---	---	---	---	---	---	---			
17:												
LAVACREEK	0-10	7-15	0.70-0.80	4.00-14.00	0.09-0.12	0.0-2.9	1.0-3.0	.28	.32	3	8	0
	10-19	7-15	0.80-0.90	4.00-14.00	0.08-0.11	0.0-2.9	1.0-2.0	.24	.43			
	19-36	7-15	1.00-1.20	4.00-14.00	0.08-0.11	0.0-2.9	1.0-2.0	.24	.43			
	36-42	6-10	1.20-1.30	14.00-42.00	0.05-0.08	0.0-2.9	0.5-1.0	.24	.43			
	42-59	6-10	1.20-1.30	14.00-42.00	0.05-0.08	0.0-2.9	0.5-1.0	.24	.43			
	59-69	---	---	---	---	---	---	---	---			
VITALE	0-3	12-25	1.30-1.45	4.00-14.00	0.09-0.12	0.0-2.9	1.0-3.0	.20	.28	2	8	0
	3-10	24-30	1.40-1.50	4.00-14.00	0.05-0.07	3.0-5.9	1.0-3.0	.10	.37			
	10-19	25-35	1.40-1.50	0.42-1.40	0.05-0.07	3.0-5.9	1.0-3.0	.10	.37			
	19-24	25-35	1.40-1.50	0.42-1.40	0.05-0.07	3.0-5.9	1.0-3.0	.10	.37			
	24-33	18-25	1.40-1.55	4.00-14.00	0.05-0.07	0.0-2.9	0.0-1.0	.17	.37			
	33-43	---	---	---	---	---	---	---	---			
18:												
LAVACREEK	0-10	7-15	0.70-0.80	4.00-14.00	0.09-0.12	0.0-2.9	1.0-3.0	.28	.32	3	8	0
	10-19	7-15	0.80-0.90	4.00-14.00	0.08-0.11	0.0-2.9	1.0-2.0	.24	.43			
	19-36	7-15	1.00-1.20	4.00-14.00	0.08-0.11	0.0-2.9	1.0-2.0	.24	.43			
	36-42	6-10	1.20-1.30	14.00-42.00	0.05-0.08	0.0-2.9	0.5-1.0	.24	.43			
	42-59	6-10	1.20-1.30	14.00-42.00	0.05-0.08	0.0-2.9	0.5-1.0	.24	.43			
	59-69	---	---	---	---	---	---	---	---			

TABLE 10. PHYSICAL PROPERTIES OF SOILS, Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer)

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Depth	Clay	Moist bulk density	Ksat	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								K	Kf	T		
	In	Pct	g/cc	um/sec	In/in	Pct	Pct					
DOLLARHIDE------	0-8	8-18	0.85-0.95	14.11-42.34	0.08-0.13	0.0-2.9	1.0-3.0	.20	.37	1	8	0
	8-13	8-18	1.35-1.50	14.11-42.34	0.05-0.09	0.0-2.9	0.5-1.0	.10	.32			
	13-16	---	---	---	---	---	---	---	---			
	16-26	---	---	---	---	---	---	---	---			
GRASSYCONE------	0-2	2-6	0.65-0.85	42.00-141.0	0.20-0.25	0.0-2.9	2.0-6.0	.64	.64	5	3	86
	2-8	4-6	0.65-0.85	42.00-141.0	0.20-0.25	0.0-2.9	1.0-4.0	.64	.64			
	8-56	6-10	0.65-0.85	42.00-141.0	0.20-0.25	0.0-2.9	0.2-2.0	.64	.64			
	56-65	24-30	1.05-1.20	4.00-14.00	0.10-0.12	0.0-2.9	0.0-0.5	.32	.64			
19:												
BANCROFT--------	0-6	15-20	1.50-1.55	4.00-14.00	0.19-0.21	0.0-2.9	2.0-3.0	.43	.43	5	5	56
	6-12	15-20	1.50-1.55	4.00-14.00	0.19-0.21	0.0-2.9	2.0-3.0	.43	.43			
	12-15	18-32	1.50-1.55	4.00-14.00	0.19-0.21	0.0-2.9	0.5-2.0	.43	.43			
	15-26	18-32	1.50-1.55	4.00-14.00	0.19-0.21	0.0-2.9	0.5-2.0	.43	.43			
	26-48	18-32	1.50-1.55	4.00-14.00	0.19-0.21	0.0-2.9	0.5-2.0	.43	.43			
	48-60	18-32	1.50-1.55	4.00-14.00	0.19-0.21	0.0-2.9	0.5-2.0	.43	.43			
20:												
MCBIGGAM--------	0-3	10-15	1.25-1.40	4.00-14.00	0.18-0.22	0.0-2.9	1.0-2.0	.43	.43	5	6	48
	3-10	10-15	1.25-1.40	4.00-14.00	0.18-0.22	0.0-2.9	1.0-2.0	.43	.43			
	10-15	22-32	1.25-1.40	1.40-4.00	0.16-0.18	3.0-5.9	0.5-1.0	.32	.32			
	15-26	22-32	1.25-1.40	1.40-4.00	0.16-0.18	3.0-5.9	0.5-1.0	.32	.32			
	26-36	40-50	1.30-1.45	0.42-1.40	0.13-0.17	6.0-8.9	0.0-1.0	.32	.32			
	36-46	40-50	1.30-1.45	0.42-1.40	0.13-0.17	6.0-8.9	0.0-1.0	.32	.32			
	46-80	30-40	1.25-1.45	1.40-4.00	0.15-0.19	3.0-5.9	0.0-0.5	.37	.37			

TABLE 11. ENGINEERING INDEX PROPERTIES
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO, Detailed Soil survey
(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1:												
Lava flows-----	---	---	---	---	---	---	---	---	---	---	---	---
2:												
Lava flows-----	---	---	---	---	---	---	---	---	---	---	---	---
Cinderhurst----	0-3	Extremely cobbly silt loam	GM	A-2, A-5, A-4	0-5	55-70	50-60	45-55	40-55	30-50	35-45	NP-5
	3-8	Very cobbly silt loam, very gravelly silt loam, extremely cobbly loam	GM, ML	A-2, A-4, A-5	10-25	25-65	50-90	45-85	40-80	30-75	35-45	5-10
	8-18	Unweathered bedrock			---	---	---	---	---	---	---	---
3:												
Lava flows-----	---	---	---	---	---	---	---	---	---	---	---	---
Cinderhurst----	0-4	Very cobbly silt loam,	GM, ML	A-4, A-2, A-5	10-25	25-65	50-90	45-85	40-80	30-75	35-45	5-10
	4-14	Unweathered bedrock			---	---	---	---	---	---	---	---
4:												
Treemold-------	0-2	Very gravelly loam	SC-SM	A-2	0	0	95-100	35-55	25-45	20-40	20-30	NP-5
	2-9	Very gravelly loam, very gravelly sandy loam	SC-SM	A-2	0	0	95-100	30-45	20-40	20-35	20-30	NP-5
	9-19	Unweathered bedrock			---	---	---	---	---	---	---	---
Silentcone------	0-4	Very gravelly loam	SC-SM	A-2	0	0	90-100	35-55	25-50	25-45	20-30	NP-5
	4-10	Very gravelly loam	SC-SM	A-2	0	0	90-100	35-55	25-50	25-45	20-30	NP-5
	10-24	Very gravelly sandy loam	SC-SM	A-2	0	0	90-100	30-50	20-40	20-35	20-30	NP-5
	24-48	Unweathered bedrock			---	---	---	---	---	---	---	---
	48-58	Unweathered bedrock			---	---	---	---	---	---	---	---
Lava flows-----	---	---	---	---	---	---	---	---	---	---	---	---

TABLE 11. ENGINEERING INDEX PROPERTIES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO, Detailed Soil survey
(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
5:												
Cinder land----	---	---	---	---	---	---	---	---	---	---	---	---
Northcrater----	0-4	Very gravelly loamy sand	GC-GM	A-2	0	0	45-65	10-45	5-40	5-25	15-25	NP-5
	4-8	Very gravelly loamy sand	GC-GM	A-2	0	0	40-60	10-40	5-35	5-25	15-25	NP-5
	8-12	Extremely gravelly loamy sand	GC-GM	A-1	0	0	25-45	10-25	5-20	5-15	15-25	NP-5
	12-20	Very gravelly loamy sand	GC-GM	A-2	0	0	40-60	10-40	5-35	5-25	15-25	NP-5
	20-30	Very gravelly loamy sand	GC-GM	A-2	0	0	40-60	10-40	5-35	5-25	15-25	NP-5
	30-60	Very gravelly loamy sand	GC-GM	A-1	0	0	25-45	10-25	5-25	5-15	15-25	NP-5
6:												
Bigcinder------	0-2	Sandy loam	GC-GM	A-4	0	0	75-90	55-85	45-75	36-60	15-25	NP-5
	2-6	Very gravelly sandy loam	GC-GM	A-2	0	0	45-55	35-45	25-40	15-30	15-25	NP-5
	6-10	Very gravelly sandy loam	GC-GM	A-2	0	0	45-55	35-45	25-40	15-30	15-25	NP-5
	10-20	Gravel			0	0	25-35	5-10	0	0	0-0	NP
	20-24	Very gravelly loamy sand	GC-GM	A-2	0	0	40-50	30-40	25-35	15-30	15-25	NP-5
	24-30	Very gravelly loamy sand	GC-GM	A-2	0	0	35-45	25-35	20-30	10-25	15-25	NP-5
	30-60	Gravel			0	0	25-35	5-10	0	0	0-0	NP
7:												
Infernocone----	0-5	Gravelly loamy sand	GC-GM	A-4	0	0	60-80	50-70	40-65	15-50	20-30	NP-5
	5-10	Gravelly sandy loam	GC-GM	A-4	0	0	55-70	45-60	35-55	10-40	20-30	NP-5
	10-25	Gravelly sandy loam	GC-GM	A-4	0	0	55-70	45-60	35-55	10-40	15-25	NP-5
	25-35	Very gravelly sandy loam	GC-GM	A-2	0	0	40-50	25-35	15-25	5-25	15-25	NP-5
	35-60	Gravel	GC-GM	A-1	0	0	25-35	5-10	0	0	15-25	NP-5
8:												
Infernocone----	0-5	Gravelly loamy sand	GC-GM	A-4	0	0	60-80	50-70	40-65	15-50	20-30	NP-5
	5-10	Gravelly sandy loam	GC-GM	A-4	0	0	55-70	45-60	35-55	10-40	20-30	NP-5
	10-25	Gravelly sandy loam	GC-GM	A-4	0	0	55-70	45-60	35-55	10-40	15-25	NP-5
	25-35	Very gravelly sandy loam	GC-GM	A-2	0	0	40-50	25-35	15-25	5-25	15-25	NP-5
	35-60	Gravel	GC-GM	A-1	0	0	25-35	5-10	0	0	15-25	NP-5

TABLE 11. ENGINEERING INDEX PROPERTIES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO, Detailed Soil survey
(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
9:												
Echocrater	0-3	Gravelly loamy sand	GC-GM	A-4	0	0	70-80	35-70	25-65	15-40	15-25	NP-5
	3-8	Gravelly loamy sand	GC-GM	A-2	0	0	55-75	30-65	20-55	10-35	15-25	NP-5
	8-15	Gravelly loamy sand	GC-GM	A-2	0	0	45-65	25-55	15-35	5-25	15-25	NP-5
	15-25	Very gravelly loamy sand	GC-GM	A-1	0	0	30-50	20-45	10-25	5-20	15-25	NP-5
	25-60	Gravel	GC-GM	A-1	0	0	30-55	15-40	0	0	0-0	NP
10:												
Roundknoll	0-3	Gravelly loamy sand	GC-GM	A-4	0	0	65-85	55-75	45-65	30-50	15-25	NP-5
	3-10	Gravelly loamy sand	GC-GM	A-2	0	0	55-75	45-65	30-50	20-30	15-25	NP-5
	10-15	Very gravelly loamy sand	GC-GM	A-1	0	0	40-55	20-35	10-25	5-20	15-25	NP-5
	15-20	Very gravelly loamy sand	GC-GM	A-2	0	0	45-60	25-40	15-30	10-25	15-25	NP-5
	20-30	Very gravelly loamy sand	GC-GM	A-1	0	0	40-55	20-35	10-25	5-20	15-25	NP-5
	30-60	Extremely gravelly sand	GC-GM	A-1	0	0	25-35	15-25	5-15	0-10	15-25	NP-5
11:												
Hal	0-6	Gravelly loam	SM	A-2, A-4	0	0	100	45-70	40-65	25-50	20-30	NP-5
	6-12	Gravelly loam	SM	A-2, A-4	0	0	100	45-70	40-65	25-50	20-30	NP-5
	12-24	Gravelly loam	SM	A-2, A-4	0	0	100	45-70	40-65	25-50	20-30	NP-5
	24-40	Gravelly loam	SM	A-2, A-4	0	0	100	45-70	40-65	25-50	20-30	NP-5
	40-60	Extremely gravelly loamy coarse sand	SP	A-1	0	0	100	5-20	1-10	1-5	0-0	NP
Moonville	0-7	Loam	ML	A-4, A-5	0	0	85-95	75-95	60-80	50-70	35-50	NP-5
	7-15	Loam	ML	A-4, A-5	0	0	90-100	75-95	60-80	50-70	35-50	NP-5
	15-31	Loam	ML	A-4, A-5	0	0	90-100	75-95	60-80	50-70	35-50	NP-5
	31-60	Loam	ML	A-4, A-5	0	0	90-100	75-95	60-80	50-70	35-50	NP-5
12:												
Sunsetcone	0-4	Gravelly loam	GC-GM	A-2	0	0	30-80	25-70	20-65	15-40	20-30	NP-5
	4-6	Gravelly loam	GC-GM	A-2	0	0	35-80	30-75	25-75	20-45	15-25	NP-5
	6-10	Very gravelly loam	GC-GM	A-2	0	0	25-70	20-60	10-45	5-35	15-25	NP-5
	10-24	Very gravelly sandy loam	GC-GM	A-2	0	0	25-70	20-60	10-45	5-35	15-25	NP-5
	24-30	Cobbles			0	70-80	10-20	5-10	0	0	0-0	NP
	30-60	Gravel			0	0	10-20	5-10	0	0	0-0	NP

TABLE 11. ENGINEERING INDEX PROPERTIES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO, Detailed Soil survey
(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
13:												
Sunsetcone-----	0-4	Gravelly loam	GC-GM	A-2	0	0	30-80	25-70	20-65	15-40	20-30	NP-5
	4-6	Gravelly loam	GC-GM	A-2	0	0	35-80	30-75	25-75	20-45	15-25	NP-5
		loam										
	10-24	Very gravelly	GC-GM	A-2	0	0	25-70	20-60	10-45	5-35	15-25	NP-5
		sandy loam										
	24-30	Cobbles			0	70-80	10-20	5-10	0	0	0-0	NP
	30-60	Gravel			0	0	10-20	5-10	0	0	0-0	NP
Grassycone-----	0-2	Fine sandy loam	ML, SM	A-4	0	0	95-100	90-100	70-90	35-55	30-40	NP-5
	2-8	Very gravelly	GM, SM	A-2, A-1, A-4	0	0	55-90	50-85	40-60	15-50	30-40	NP-5
		fine sandy										
		loam, gravelly										
		fine sandy										
		loam, fine										
		sandy loam										
	8-56	Gravelly fine	SM	A-1, A-2, A-4	0	0-5	70-80	65-80	40-50	20-40	30-40	NP-5
		sandy loam										
	56-65	Cobbly loam,	CL, GC	A-6	0	15-35	60-90	60-90	45-80	35-70	30-40	10-15
		cobbly clay										
		loam										
14:												
Goodalfs-------	0-3	Silt loam	ML	A-4	0	0	100	95-100	85-100	80-100	20-30	NP-5
	3-10	Silt loam	CL-ML	A-4	0	0	100	95-100	85-100	80-100	25-35	5-10
	10-24	Silt loam	CL-ML	A-4	0	0	100	95-100	85-100	80-100	25-35	5-15
	24-40	Silty clay loam	CL	A-6	0	0	100	95-100	85-100	80-100	30-45	10-20
	40-60	Silt loam	CL-ML	A-4	0	0	100	95-100	85-100	80-100	25-40	5-15
Craters--------	0-4	Gravelly loamy	GC-GM	A-2	0	0	45-60	40-50	30-45	15-35	20-30	NP-5
		sand										
	4-10	Gravelly loamy	GC-GM	A-2	0	0	40-50	35-45	25-40	10-30	20-30	NP-5
		sand										
	10-22	Very gravelly	GC-GM	A-2	0	0	35-55	30-40	25-35	10-25	20-30	NP-5
		sandy loam										
	22-38	Gravelly sandy	GC-GM	A-2	0	0	50-65	45-60	35-55	15-40	20-30	5-10
		loam										
	38-60	Gravelly sandy	GC-GM	A-2	0	0	55-70	50-65	40-65	15-45	20-30	5-10
		loam										
15:												
Vitale---------	0-3	Very gravelly	GC, GC-GM	A-1, A-2	0	10-15	35-60	30-55	25-45	20-35	25-35	5-15
		loam										
	3-10	Very cobbly	GC	A-2, A-6	0-15	10-30	35-65	30-60	30-55	25-45	25-35	5-15
		loam										
	10-19	Very gravelly	GC	A-2, A-7, A-6	0-15	10-30	35-65	30-60	30-55	25-45	35-45	15-25
		clay loam,										
		very cobbly										
		clay loam,										
		very cobbly										
		loam										

TABLE 11. ENGINEERING INDEX PROPERTIES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO, Detailed Soil survey
(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
	19-24	Very gravelly clay loam, very cobbly clay loam, very cobbly loam	GC	A-2, A-6, A-7	0-15	10-30	35-65	30-60	30-55	25-45	35-45	15-25
	24-33	Very gravelly loam, very cobbly loam	GC, GC-GM	A-2	0-20	15-25	35-55	35-50	30-45	25-35	25-35	5-15
	33-43	Unweathered bedrock			---	---	---	---	---	---	---	---
Blackspar	0-2	Very cobbly loam	GM, SM	A-2, A-4	0	20-65	45-85	40-65	35-60	25-50	25-35	NP-10
	2-6	Very cobbly loam	GM, SM	A-2, A-4	0	20-65	45-85	40-65	35-60	25-50	25-35	NP-10
	6-12	Very cobbly loam, extremely cobbly loam, very cobbly clay loam	GC	A-2, A-6	0	25-65	35-65	30-65	25-65	20-50	30-40	10-20
	12-22	Unweathered bedrock			---	---	---	---	---	---	---	---
16:												
Lavacreek	0-10	Very gravelly silt loam	GM	A-2, A-5, A-4	0	0-25	45-60	40-55	35-50	30-50	35-45	NP-5
	10-19	Very gravelly loam, very cobbly loam, extremely cobbly loam	GM, ML	A-2, A-4	0	30-55	45-75	40-70	30-65	25-65	25-35	NP-5
	19-36	Very gravelly loam, very cobbly loam, extremely cobbly loam	GM, ML	A-2, A-4	0	30-55	45-75	40-70	30-65	25-65	25-35	NP-5
	36-42	Very gravelly loam, extremely gravelly loam, extremely cobbly sandy loam	GM	A-2, A-1, A-4	0	40-55	30-65	25-60	20-55	10-45	20-25	NP-5
	42-59	Very gravelly loam, extremely gravelly loam, extremely cobbly sandy	GM	A-1, A-2, A-4	0	40-55	30-65	25-60	20-55	10-45	20-25	NP-5
	59-69	Unweathered bedrock			---	---	---	---	---	---	---	---

TABLE 11. ENGINEERING INDEX PROPERTIES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO, Detailed Soil survey
(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
Dollarhide-----	0-8	Very gravelly silt loam	GM	A-2, A-4	0	0-25	40-55	35-50	30-50	25-45	20-25	NP-5
	8-13	Extremely cobbly fine sandy loam, extremely cobbly loam, very gravelly loam	GM	A-1, A-2	0-15	15-60	40-50	40-45	30-40	15-30	20-25	NP-5
	13-16	Unweathered bedrock			---	---	---	---	---	---	---	---
	16-26	Unweathered bedrock			---	---	---	---	---	---	---	---
17:												
Lavacreek------	0-10	Very gravelly silt loam	GM	A-4, A-2, A-5	0	0-25	45-60	40-55	35-50	30-50	35-45	NP-5
	10-19	Very gravelly loam, very cobbly loam, extremely cobbly loam	GM, ML	A-2, A-4	0	30-55	45-75	40-70	30-65	25-65	25-35	NP-5
	19-36	Very gravelly loam, very cobbly loam, extremely cobbly loam	GM, ML	A-2, A-4	0	30-55	45-75	40-70	30-65	25-65	25-35	NP-5
	36-42	Very gravelly loam, extremely gravelly loam, extremely cobbly sandy loam	GM	A-1, A-2, A-4	0	40-55	30-65	25-60	20-55	10-45	20-25	NP-5
	42-59	Very gravelly loam, extremely gravelly loam, extremely cobbly sandy loam	GM	A-2, A-1, A-4	0	40-55	30-65	25-60	20-55	10-45	20-25	NP-5
	59-69	Unweathered bedrock			---	---	---	---	---	---	---	---
Vitale---------	0-3	Very gravelly loam	GC, GC-GM	A-1, A-2	0	10-15	35-60	30-55	25-45	20-35	25-35	5-15
	3-10	Very gravelly clay loam, very cobbly clay loam, very cobbly loam	GC	A-2, A-6	0-15	10-30	35-65	30-60	30-55	25-45	25-35	5-15

TABLE 11. ENGINEERING INDEX PROPERTIES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO, Detailed Soil survey
(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
	10-19	Very gravelly clay loam, very cobbly clay loam, very cobbly loam	GC	A-6, A-2, A-7	0-15	10-30	35-65	30-60	30-55	25-45	35-45	15-25
	19-24	Very gravelly clay loam, very cobbly clay loam, very cobbly loam	GC	A-6, A-2, A-7	0-15	10-30	35-65	30-60	30-55	25-45	35-45	15-25
	24-33	Very gravelly loam, very cobbly loam	GC, GC-GM	A-2	0-20	15-25	35-55	35-50	30-45	25-35	25-35	5-15
	33-43	Unweathered bedrock			---	---	---	---	---	---	---	---
18:												
Lavacreek------	0-10	Very gravelly silt loam	GM	A-4, A-2, A-5	0	0-25	45-60	40-55	35-50	30-50	35-45	NP-5
	10-19	Very gravelly loam, very cobbly loam, extremely cobbly loam	GM, ML	A-2, A-4	0	30-55	45-75	40-70	30-65	25-65	25-35	NP-5
	19-36	Very gravelly loam, very cobbly loam, extremely cobbly loam	GM, ML	A-2, A-4	0	30-55	45-75	40-70	30-65	25-65	25-35	NP-5
	36-42	Very gravelly loam, extremely gravelly loam, extremely cobbly sandy loam	GM	A-1, A-2, A-4	0	40-55	30-65	25-60	20-55	10-45	20-25	NP-5
	42-59	Very gravelly loam, extremely gravelly loam, extremely cobbly sandy loam	GM	A-2, A-1, A-4	0	40-55	30-65	25-60	20-55	10-45	20-25	NP-5
	59-69	Unweathered bedrock			---	---	---	---	---	---	---	---

TABLE 11. ENGINEERING INDEX PROPERTIES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO, Detailed Soil survey
(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
Dollarhide-----	0-8	Very gravelly silt loam	GM	A-2, A-4	0	0-25	40-55	35-50	30-50	25-45	20-25	NP-5
	8-13	Extremely sandy loam, extremely cobbly loam, very gravelly loam	GM	A-1, A-2	0-15	15-60	40-50	40-45	30-40	15-30	20-25	NP-5
	13-16	Unweathered bedrock			---	---	---	---	---	---	---	---
	16-26	Unweathered bedrock			---	---	---	---	---	---	---	---
Grassycone-----	0-2	Fine sandy loam	ML, SM	A-4	0	0	95-100	90-100	70-90	35-55	30-40	NP-5
	2-8	Very gravelly fine sandy loam, gravelly fine sandy loam, fine sandy loam	GM, SM	A-1, A-2, A-4	0	0	55-90	50-85	40-60	15-50	30-40	NP-5
	8-56	Gravelly fine sandy loam	SM	A-2, A-1, A-4	0	0-5	70-80	65-80	40-50	20-40	30-40	NP-5
	56-65	Cobbly loam, very cobbly loam, cobbly clay loam	CL, GC	A-6	0	15-35	60-90	60-90	45-80	35-70	30-40	10-15
19:												
Bancroft-------	0-6	Silt loam	CL-ML, ML	A-4	0	0	100	100	100	95-100	20-30	NP-10
	6-12	Silt loam	CL-ML, ML	A-4	0	0	100	100	100	95-100	20-30	NP-10
	12-15	Silt loam, silty clay loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	15-26	Silt loam, silty clay loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	26-48	Silt loam, silty clay loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	48-60	Silt loam, silty clay loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20

TABLE 11. ENGINEERING INDEX PROPERTIES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO, Detailed Soil survey
(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
20:												
MCBIGGAM-----	0-3	Silt loam	ML	A-4	0	0	90-100	85-100	85-100	80-90	20-25	NP-5
	3-10	Silt loam	ML	A-4	0	0	90-100	85-100	85-100	80-90	20-25	NP-5
	10-15	Silt loam, silty clay loam	CL	A-6	0	0-10	95-100	95-100	95-100	75-90	30-40	10-20
	15-26	Silt loam, silty clay loam	CL	A-6	0	0-10	95-100	95-100	95-100	75-90	30-40	10-20
	26-36	Silty clay	CH, CL	A-7	0	0	100	95-100	95-100	80-95	45-60	30-40
	36-46	Silty clay	CH, CL	A-7	0	0	100	95-100	95-100	80-95	45-60	30-40
	46-80	Silty clay loam, clay loam	CL, ML	A-6, A-7	0	0	100	95-100	95-100	75-95	35-45	10-20

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NATURAL RESOURCES CONSERVATION SERVICE

TABLE 12. SOIL FEATURES
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Restrictions				Subsidence		Potential frost action	Risk of corrosion	
	Depth	Kind	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In		In	In			
1:									
LAVA FLOWS	---	---	---	---	---	---	---	---	---
2:									
LAVA FLOWS	---	---	---	---	---	---	---	---	---
CINDERHURST	4-10	Bedrock (lithic)	---	Indurated	0	---	Moderate	Moderate	Low
3:									
LAVA FLOWS	---	---	---	---	---	---	---	---	---
CINDERHURST	1-4	Bedrock (lithic)	---	Indurated	0	---	Moderate	Moderate	Low
4:									
TREEMOLD	4-10	Bedrock (lithic)	---	Indurated	0	---	Low	High	Low
SILENTCONE	20-30	Bedrock (lithic)	---	Indurated	0	---	Low	High	Low
LAVA FLOWS	---	---	---	---	---	---	---	---	---
5:									
CINDER LAND	---	---	---	---	0	---	Low	High	Low
NORTHCRATER	---	---	---	---	0	---	Low	High	Low
6:									
BIGCINDER	5-18	Strongly contrasting textural stratification	8-15	Noncemented	0	---	Moderate	High	Low
7:									
INFERNOCONE	25-40	Abrupt textural change	20-35	Noncemented	0	---	Moderate	High	Low

TABLE 12. SOIL FEATURES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Restrictions				Subsidence		Potential frost action	Risk of corrosion	
	Depth	Kind	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In		In	In			
8:									
INFERNOCONE-----	25-40	Abrupt textural change	20-35	Noncemented	0	---	Moderate	High	Low
9:									
ECHOCRATER------	20-35	Abrupt textural change	25-50	Noncemented	0	---	Moderate	High	Low
10:									
ROUNDKNOLL------	---	---	---	---	0	---	Moderate	High	Low
11:									
HAL----------	---	---	---	---	0	---	High	Moderate	Moderate
MOONVILLE-------	---	---	---	---	0	---	Moderate	High	Low
12:									
SUNSETCONE------	14-40	Strongly contrasting textural stratification	20-56	Noncemented	0	---	Low	High	Low
13:									
SUNSETCONE------	14-40	Strongly contrasting textural stratification	20-56	Noncemented	0	---	Low	High	Low
GRASSYCONE------	---	---	---	---	0	---	Moderate	Moderate	Moderate
14:									
GOODALFS--------	---	---	---	---	0	---	High	High	Low
CRATERS---------	---	---	---	---	0	---	High	High	Low
15:									
VITALE----------	20-40	Bedrock (lithic)	---	Indurated	0	---	Moderate	Moderate	Low
BLACKSPAR-------	10-20	Bedrock (lithic)	---	Indurated	0	---	Low	Moderate	Low

TABLE 12. SOIL FEATURES, Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Restrictions				Subsidence		Potential frost action	Risk of corrosion	
	Depth	Kind	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In		In	In			
16:									
LAVACREEK	40-60	Bedrock (lithic)	---	Indurated	0	---	Moderate	Moderate	Moderate
DOLLARHIDE	10-20	Bedrock (lithic)	---	Indurated	0	---	Moderate	Moderate	Low
17:									
LAVACREEK	40-60	Bedrock (lithic)	---	Indurated	0	---	Moderate	Moderate	Moderate
VITALE	20-40	Bedrock (lithic)	---	Indurated	0	---	Moderate	Moderate	Low
18:									
LAVACREEK	40-60	Bedrock (lithic)	---	Indurated	0	---	Moderate	Moderate	Moderate
DOLLARHIDE	10-20	Bedrock (lithic)	---	Indurated	0	---	Moderate	Moderate	Low
GRASSYCONE	---	---	---	---	0	---	Moderate	Moderate	Moderate
19:									
BANCROFT	---	---	---	---	0	---	High	High	Low
20:									
MCBIGGAM	---	---	---	---	0	---	High	High	Low

TABLE 13. WATER FEATURES
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO, Detailed Soil Survey

(Depths of layers are in feet. See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydrologic group	Month	Ponding			Flooding	
			Surface water depth	Duration	Frequency	Duration	Frequency
1:							
Lava Flows	---	All months	---	---	---	---	---
2:							
Lava Flows		All months	---	---	---	---	---
Cinderhurst	D	All months	---	---	---	---	---
3:							
Lava Flows	---	All months	---	---	---	---	---
Cinderhurst	D	All months	---	---	---	---	---
4:							
Treemold	A	All months	---	---	---	---	---
Silentcone	A	All months	---	---	---	---	---
Lava Flows	---	All months	---	---	---	---	---
5:							
Cinder land	---	All months	---	---	---	---	---
Northcrater	A	All months	---	---	---	---	---
6:							
Bigcinder	D	All months	---	---	---	---	---
7:							
Infernocone	A	All months	---	---	---	---	---
8:							
Infernocone	A	All months	---	---	---	---	---
9:							
Echocrater	D	All months	---	---	---	---	---
10:							
Roundknoll	A	All months	---	---	---	---	---
11:							
Hal	B	All months	---	---	---	---	---

Table 13. Water Features--Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO, Detailed Soil Survey

Map symbol and soil name	Hydrologic group	Month	Ponding			Flooding	
			Surface water depth	Duration	Frequency	Duration	Frequency
Moonville	B						
		All months	---	---	---	---	---
12:							
Sunsetcone	C						
		All months	---	---	---	---	---
13:							
		All months	---	---	---	---	---
Grassycone	A						
		All months	---	---	---	---	---
Sunsetcone	C						
		All months	---	---	---	---	---
14:							
Goodalfs	B						
		April	0.5-0.8	Brief	Occasional	---	---
		May	0.5-0.8	Brief	Occasional	---	---
Craters	A						
		All months	---	---	---	---	---
15:							
Vitale	C						
		All months	---	---	---	---	---
Blackspar	D						
		All months	---	---	---	---	---
16:							
Lavacreek	B						
		All months	---	---	---	---	---
Dollarhide	D						
		All months	---	---	---	---	---
17:							
Lavacreek	B						
		All months	---	---	---	---	---
Vitale	C						
		All months	---	---	---	---	---
18:							
Lavacreek	B						
		All months	---	---	---	---	---
Dollarhide	D						
		All months	---	---	---	---	---
Grassycone	A						
		All months	---	---	---	---	---
19:							
Bancroft	B						
		All months	---	---	---	---	---
20:							
Mcbiggam	C	All months	---	---	---	---	---

TABLE 14. SANITARY FACILITIES

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1:					
LAVA FLOWS	---	---	---	---	---
2:					
LAVA FLOWS	---	---	---	---	---
CINDERHURST	Severe: large stones, depth to rock	Severe: large stones, slope, depth to rock	Severe: large stones, depth to rock	Severe: depth to rock	Poor: depth to rock
3:					
LAVA FLOWS	---	---	---	---	---
CINDERHURST	Severe: large stones, depth to rock	Severe: large stones, slope, depth to rock	Severe: large stones, depth to rock	Severe: depth to rock	Poor: depth to rock
4:					
TREEMOLD	Severe: depth to rock	Severe: slope, depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: small stones, depth to rock
SILENTCONE	Severe: depth to rock	Severe: slope, depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: small stones, depth to rock
LAVA FLOWS	---	---	---	---	---
5:					
CINDER LAND	---	---	---	---	---
NORTHCRATER	Severe: poor filter	Severe: seepage, slope	Severe: seepage	Severe: seepage	Severe: small stones
6:					
BIGCINDER	Severe: slope, poor filter	Severe: seepage, slope	Severe: seepage, slope	Severe: seepage, slope	Severe: seepage, slope, small stones
7:					
INFERNOCONE	Severe: poor filter	Severe: seepage, slope	Severe: seepage	Severe: seepage	Severe: seepage
8:					
INFERNOCONE	Severe: slope, poor filter	Severe: seepage, slope	Severe: seepage, slope	Severe: seepage, slope	Severe: seepage, slope, small stones
9:					
ECHOCRATER	Severe: slope, poor filter	Severe: seepage, slope	Severe: seepage, slope	Severe: seepage, slope	Severe: seepage, slope, small stones

TABLE 14. SANITARY FACILITIES--Continued

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
10:					
ROUNDKNOLL	Severe: slope, poor filter	Severe: seepage, slope	Severe: seepage, slope	Severe: seepage, slope	Severe: seepage, slope, small stones
11:					
HAL	Severe: slope	Severe: seepage, slope	Severe: seepage, slope	Severe: slope	Poor: seepage, slope, small stones
MOONVILLE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Poor: slope
12:					
SUNSETCONE	Severe: large stones, slope, poor filter	Severe: large stones, seepage, slope	Severe: large stones, seepage, slope	Severe: seepage, slope	Severe: large stones, seepage, slope
13:					
SUNSETCONE	Severe: large stones, slope, poor filter	Severe: large stones, seepage, slope	Severe: large stones, seepage, slope	Severe: seepage, slope	Severe: large stones, seepage, slope
GRASSYCONE	Severe: slope, poor filter	Severe: seepage, slope	Severe: slope	Severe: seepage, slope	Poor: slope
14:					
GOODALFS	Severe: percs slowly, ponding	Severe: ponding	Severe: ponding	Severe: ponding	Severe: ponding
CRATERS	Slight	Slight	Slight	Slight	Moderate: small stones
15:					
VITALE	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Poor: slope, small stones, depth to rock
BLACKSPAR	Severe: large stones, slope, depth to rock	Severe: large stones, slope, depth to rock	Severe: large stones, slope, depth to rock	Severe: slope, depth to rock	Poor: slope, small stones, depth to rock
16:					
LAVACREEK	Severe: slope	Severe: large stones, seepage, slope	Severe: seepage, slope, depth to rock	Severe: seepage, slope	Poor: slope, small stones
DOLLARHIDE	Severe: slope, depth to rock	Severe: seepage, slope, depth to rock	Severe: seepage, slope, depth to rock	Severe: slope, depth to rock	Poor: large stones, slope, depth to rock

TABLE 14. SANITARY FACILITIES--Continued
CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
17:					
LAVACREEK	Severe: slope	Severe: large stones, seepage, slope	Severe: seepage, slope, depth to rock	Severe: seepage, slope	Poor: slope, small stones
VITALE	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Poor: slope, small stones, depth to rock
18:					
LAVACREEK	Severe: slope	Severe: large stones, seepage, slope	Severe: seepage, slope, depth to rock	Severe: seepage, slope	Poor: slope, small stones
DOLLARHIDE	Severe: slope, depth to rock	Severe: seepage, slope, depth to rock	Severe: seepage, slope, depth to rock	Severe: slope, depth to rock	Poor: large stones, slope, depth to rock
GRASSYCONE	Severe: slope, poor filter	Severe: seepage, slope	Severe: slope	Severe: seepage, slope	Poor: slope
19:					
BANCROFT	Moderate: percs slowly	Moderate: seepage, slope	Moderate: too clayey	Slight	Fair: too clayey
20:					
MCBIGGAM	Severe: percs slowly	Moderate: slope	Severe: too clayey	Slight	Poor: hard to pack, too clayey

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TABLE 15. CONSTRUCTION MATERIALS

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1:				
LAVA FLOWS-----	---	---	---	---
2:				
LAVA FLOWS-----	---	---	---	---
CINDERHURST----	Poor: large stones depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: large stones depth to rock
3:				
LAVA FLOWS-----	---	---	---	---
CINDERHURST----	Poor: large stones depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: large stones depth to rock
4:				
TREEMOLD-------	Poor: thin layer depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones thin layer depth to rock
SILENTCONE-----	Poor: thin layer depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim small stones
LAVA FLOWS-----	---	---	---	---
5:				
CINDER LAND----	---	---	---	---
NORTHCRATER----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope small stones

TABLE 15. CONSTRUCTION MATERIALS, Continued

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
6: BIGCINDER	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope; small stones
7: INFERNOCONE	Fair: thin layer	Improbable: excess fines	Improbable: excess fines	Fair: small stones
8: INFERNOCONE	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope
9: ECHOCRATER	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: small stones
10: ROUNDKNOLL	Moderate: thin layer	Improbable: excess fines	Improbable: excess fines	Poor: small stones
11: HAL	Poor: slope	Probable	Improbable: too sandy	Poor: area reclaim; slope; small stones
MOONVILLE	Fair: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope
12: SUNSETCONE	Poor: slope; thin layer	Improbable: excess fines	Improbable: excess fines	Poor: slope; small stones
13: SUNSETCONE	Poor: slope; thin layer	Improbable: excess fines	Improbable: excess fines	Poor: slope; small stones
GRASSYCONE	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope; small stones

TABLE 15. CONSTRUCTION MATERIALS, Continued

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
14:				
GOODALFS	Moderate: shrink-swell	Improbable: excess fines	Improbable: excess fines	Good
CRATERS	Good	Improbable: excess fines	Improbable: excess fines	Poor: small stones
15:				
VITALE	Poor: slope, depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope, small stones
BLACKSPAR	Poor: large stones, slope, depth to rock	Improbable: large stones, excess fines	Improbable: large stones, excess fines	Poor: large stones, slope, depth to rock
16:				
LAVACREEK	Poor: slope	Improbable: large stones, excess fines	Improbable: large stones, excess fines	Poor: area reclaim, slope, small stones
DOLLARHIDE	Poor: slope, depth to rock	Improbable: large stones, excess fines	Improbable: large stones, excess fines	Poor: slope, small stones, depth to rock
17:				
LAVACREEK	Poor: slope	Improbable: large stones, excess fines	Improbable: large stones, excess fines	Poor: area reclaim, slope, small stones
VITALE	Poor: slope, depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope, small stones
18:				
LAVACREEK	Poor: slope	Improbable: large stones, excess fines	Improbable: large stones, excess fines	Poor: area reclaim, slope, small stones
DOLLARHIDE	Poor: slope, depth to rock	Improbable: large stones, excess fines	Improbable: large stones, excess fines	Poor: slope, small stones, depth to rock

TABLE 15. CONSTRUCTION MATERIALS, Continued

CRATERS OF THE MOON NATIONAL MONUMENT, IDAHO: Detailed Soil Survey

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
GRASSYCONE-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope
19:				
BANCROFT-------	Good	Improbable: excess fines	Improbable: excess fines	Fair: area reclaim too clayey
20:				
MCBIGGAM-------	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: small stones thin layer

TABLE 16. CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
BANCROFT	Fine-silty, mixed, superactive, frigid Calcic Argixerolls
BIGCINDER	Ashy-skeletal over fragmental or cindery, aniso, glassy Xeric Vitricryands
BLACKSPAR	Loamy-skeletal, mixed, superactive, frigid Lithic Mollic Haploxeralfs
CINDERHURST	Medial-skeletal, amorphic, frigid Lithic Vitrixerands
CRATERS	Medial, amorphic, frigid Humic Vitrixerands
DOLLARHIDE	Loamy-skeletal, mixed, superactive Lithic Haplocryolls
ECHOCRATER	Ashy-skeletal over fragmental or cindery, glassy, frigid Typic Vitrixerands
GOODALFS	Fine-loamy, mixed, superactive, frigid Vitrandic Haploxerolls
GRASSYCONE	Medial, amorphic Xeric Vitricryands
HAL	Medial, amorphic Xeric Vitricryands
INFERNOCONE	Ashy-skeletal over fragmental or cindery, glassy, frigid Humic Vitrixerands
LAVACREEK	Medial-skeletal, amorphic Xeric Vitricryands
MCBIGGAM	Fine-silty, mixed, superactive, frigid Typic Palexerolls
MOONVILLE	Medial, amorphic, frigid Typic Vitrixerands
NORTHCRATER	Ashy-skeletal, glassy, nonacid, frigid Vitrandic Xerorthents
ROUNDKNOLL	Ashy-skeletal, glassy, frigid Typic Vitrixerands
SILENTCONE	Ashy-skeletal, glassy, frigid Humic Vitrixerands
SUNSETCONE	Medial over pumiceous or cindery, amorphic over glassy Xeric Vitricryands
TREEMOLD	Ashy-skeletal, glassy, frigid Lithic Vitrixerands
VITALE	Loamy-skeletal, mixed, superactive, frigid Typic Argixerolls